EMC Test Report

Product Name: WDM Optical Transmission System

Product Model: OptiXtrans E6608

Report Number: SYBH(E)06747549EA

Reliability Laboratory of Huawei Technologies Co., Ltd.

(Global Compliance and Testing Center of Huawei Technologies Co., Ltd.)

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Notice

1. The laboratory has passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.
2. The laboratory has passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been recognized by the US Federal Communications Commission (FCC) to perform compliance testing subject to the Commission's Certification rules. The Designation Number is CN1173, and the Test Firm Registration Number is 294140.
4. The laboratory has been recognized by the Innovation, Science and Economic Development Canada (ISED) to test to Canadian radio equipment requirements. The CAB identifier is CN0003, and the IC# is 21741.
5. The laboratory has been listed by VCCI to perform electromagnetic emission measurements.
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Product Name:	WDM Optical Transmission System
Product Model:	OptiXtrans E6608

Date of Receipt Sample:	2020-06-21
Start Date of Test:	2020-06-22
End Date of Test:	2020-07-08

Test Result: Pass

Approved by Senior Engineer:	2020-07-11	Fang Yan	Fang Yan
	Date	Name	Signature

Prepared by:	2020-07-10	Liu Baojin	Liu Baojin
	Date	Name	Signature

Modification Record

No.	Last Report No.	Modification Description
1	N/A	First report

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1 General Information

1.1 Applied Standard

Applied Product Standard:	EN 55032:2012/AC:2013 CISPR 32:2012 EN 55032:2015/AC:2016 CISPR 32:2015 EN 55024:2010 CISPR 24:2010 EN 55024:2010+A1:2015 CISPR 24:2010+A1:2015 EN 55035:2017 CISPR 35:2016 ETSI EN 300 386 V1.6.1:2012 ETSI EN 300 386 V2.1.1:2016 VCCI-CISPR 32:2016 AS/NZS CISPR 32:2015 IEC 61000-3-2:2014/EN 61000-3-2:2014 IEC 61000-3-3:2013/EN 61000-3-3:2013 IEC 61000-6-2:2005/EN 61000-6-2:2005 IEC 61000-6-4:2006+A1:2010/EN 61000-6-4:2007+A1:2011
Test Method:	IEC 61000-4-2:2008 IEC 61000-4-3:2010 IEC 61000-4-4:2012 IEC 61000-4-5:2014+A1:2017 IEC 61000-4-6:2013 IEC 61000-4-8:2009 IEC 61000-4-11:2004 IEC 61000-4-29:2000

1.2 Test Location

Test Location 1: Address:	Reliability Laboratory of Huawei Technologies Co., Ltd. No.1899, Xiyuan Avenue, Hi-Tech Western District, Chengdu, Sichuan, China
Test Location 2: Address:	Shenzhen Academy of Metrology&Quality Inspection Metrology and Quality Inspection Building, Central Section of Longzhu Road, Nanshan District, Shenzhen P.R.C

1.3 Test Environment Condition

Ambient Temperature:	22°C to 27°C
Relative Humidity:	45% to 55%
Atmospheric Pressure:	95kPa

2 Summary of Test Results

Table 1 Test summary

EUT Classification: Telecommunication Centre Equipment					
Test Items	**Test Configuration**	**Limit or Performance Criteria**		**Test Result**	**Location**
Radiated Emissions Enclosure Port	TC1-TC4	Class A		Pass	Location1
Conducted Emissions ☒DC Power Port ☒AC Power Port ☒Wired network Ports	TC1-TC4	Class A		Pass	Location1
Current Harmonics Emissions AC Power Port	TC4	Class A		Pass	Location1
Voltage Fluctuations and Flickers AC Power Port	TC4	Refer to section 10.4		Pass	Location1
Electrostatic Discharge Enclosure Port	TC1-TC4	Criterion B		Pass	Location1
Immunity to Radiated Electromagnetic Fields Enclosure Port	TC1-TC4	Criterion A		Pass	Location1
Immunity to Electrical Fast Transient Bursts ☐Outdoor Signal Port ☒Indoor Signal Port ☒AC Power Port ☒DC Power Port	TC1-TC4	Criterion B		Pass	Location1
Immunity to Surges ☐Outdoor Signal Port ☒Indoor Signal Port ☒AC Power Port ☒DC Power Port	TC1-TC4	Criterion B		Pass	Location1
Immunity to Continuous Conducted Interference ☐Outdoor Signal Port ☒Indoor Signal Port ☒AC Power Port ☒DC Power Port	TC1-TC4	Criterion A		Pass	Location1
Immunity to Power Frequency Magnetic Field Enclosure Port	TC1-TC4	Criterion A		Pass	Location2
Immunity to Voltage Dips and Short Interruption AC Power Port	TC4	Criterion B/C	☐With battery ☒Without battery	Pass	Location1
Immunity to Voltage Dips and Short Interruption and Voltage Variation DC Power Port	TC1-TC4	Criterion A/C	☐With battery ☒Without battery	Pass	Location1
Note: 1. Measurement taken is within the uncertainty of measurement system. 2. TC is short for test configuration 3. ☒ The item has been tested; ☐ The item has not been tested or not applicable.					

3 Equipment Specification

3.1 General Description

Huawei OptiXtrans E6608 is a highly-integrated all-optical transport platform designed for enterprises. The OptiXtrans E6608 can be widely used in industries such as energy, electric power, transportation, education, and finance that are crucial to national economy and people's livelihood.

3.2 Specification

Table 2 Main equipment specification

Rated Input Voltage	⎓ -48 V to -60 V ~ 100 V to 240 V (50/60 Hz); HVDC 240V;
Rated Power (W)	1200 W
Dimensions (W x D x H)	442 mm (W) x 224 mm (D) x 88.1 mm (H)
Weight (kg)	5.0 kg
Frequency of the Internal Source (Hz)	2 kHz, 8 kHz, 2.048 MHz, 19.2 MHz, 25 MHz, 38.88 MHz, 50 MHz, 100 MHz, 155.52 MHz, 156.25 MHz, 312.5 MHz, 313.65 MHz, 50 MHz, 51 MHz, 100 MHz, 108 MHz, 125 MHz, 155.52 MHz, 156.25 MHz, 166.628 MHz, 312.5 MHz, 622.08 MHz, 1.25 GHz, 2.5 GHz, 10.3125 GHz, 25 GHz, 28 GHz, 41.25 GHz, 103.125 GHz

Figure 1.EUT appearance of AC-powered

Figure 2.EUT appearance of DC-powered

3.3 Boards and Subassemblies

Table 3 Board list

Board Name	Description
TMK2UXCL	Universal Cross Connect, System Control and Clock Processing Board
TMB1LDCD	4-channel 100Gbit/s to 2-Channel OTUC2 Service Convergence Wavelength Conversion Board(100G Line Capacity Included, RTU Extension Supported, A24)
TNF1SP3DA	42xE1/120ohm Electrical Interface Board
TMB1EMS10	10-port Gigabit Ethernet Switching Processing Board
TMK1MDCA	2 x 100Gbit/s Or 10 x 10Gbit/s Multi-rate Ports Wavelength Conversion Board(100G Line Capacity Included, RTU Extension Supported)
TNW1AT8	8-Port 2/4 Wire and E&M Processing Board
TNF2ELOM	Enhanced 8 x Multi-rate-Service ports Multiplexing Optical Wavelength Conversion Board(OTU2)
TNF2LQM2	Double 4 x Multi-rate Ports Wavelength Conversion Board,Wind Cooling Mode
TMB1EFS8	8-Port 100M Fast Ethernet Processing Board with LAN Switch
TNW1DXM	DDN Processing Board
TNW1FXSO12	12-Port FXS/FXO Processing Board
TMB1ELOM	Enhanced 8 x Multi-rate-Service ports Multiplexing Optical Wavelength Conversion Board(OTU2)
TMK1TDC	2*100G Tributary Service Processing Board
TMK1UNS5	200G unified line service processing board (including 100G line capacity, supporting RTU extension)
TMK1SLNO	4*STM-16/8*STM-4/8*STM-1-optical interface board
TMB1SL16S	1*STM-16-optical interface board
TMK1EX10	10*10GE (SFP+) Ethernet Processing Board
TNF1SP3DA	42xE1/120ohm(T1/100ohm) Electrical Interface Board
TMB1APIU	AC Power Interface Board
TMB1PIU	Power Interface Board
TMK2FAN	Fan Box

Note: TMB1ELOM, TMB1LDX, TMK1SL64S, TMK1SL16Q, TMK1GTA, TMK1TTA and TMK1UNQ2 share the same PCB, and it is decided technically to choose TMB1ELOM to be tested.
TMB1LDCA, TMB1LTX, TMK1MDCA share the same PCB, and it is decided technically to choose TMB1MDCA to be tested.
TMB1LDCD and TMB1LDC share the same PCB, and it is decided technically to choose TMB1LDCD to be tested.
TMK1SLNO, TMB1SL41Q, TMB1SL41O, TMB1SL16S share the same PCB, and it is decided technically to choose TMK1SLNO, TMB1SL16S to be tested.
TMB1EMS10, TMB1EGS4, TMB1EFS8 share the same PCB, and it is decided technically to choose TMB1EMS10 to be tested.

Table 4 Subassembly list

Subassembly			
Subassembly Name	Model	Manufacturer	Description
Subrack	TMK2K31AFB	Huawei	Backplane Subrack (shelf, frame),OptiXtrans E6608,TMK2K31AFB,Assembly Chassis(2U,DC)

Subrack	TMK2K32AFB	Huawei	Backplane Subrack (shelf, frame),OptiXtrans E6608,TMK2K32AFB,Assembly Chassis(2U,DC,with fiber storage)
Subrack	TMK2K33AFB	Huawei	Backplane Subrack (shelf, frame),OptiXtrans E6608,TMK2K33AFB,Assembly Chassis(2U,AC)
Subrack	TMK2K34AFB	Huawei	Backplane Subrack (shelf, frame),OptiXtrans E6608,TMK2K34AFB,Assembly Chassis(2U,AC,with fiber storage)

4 System Configuration during EMC Test

The Equipment under Test (EUT) functions correctly during all tests. The EUT was installed within the test site and was configured to simulate a typical configuration.

4.1 Ports and Cables

Table 5 Ports and cables

Port	Connector	Board	Length	Qty.	Type Of Cable	Remark
AC power port	N/A	TMB1APIU	3m	2	Unshielded	TC4
DC power port	N/A	TMB1PIU	3m	2	Unshielded	TC1-TC3
ETH	RJ45	TMK2UXCL	10m	2	Shielded	TC1-TC4
EXT	RJ45	TMK2UXCL	10m	2	Shielded	TC1-TC4
TX/RX	LC	TMK2UXCL	10m	2	Fiber	TC1-TC4
USB	N/A	TMK2UXCL	10m	2	Unshielded	TC1-TC4
TX/RX	LC	TMB1SL16S	10m	1	Fiber	TC1
T/R	LC	TMK1EX10	10m	10	Fiber	TC1
TX/RX	LC	TMK1SLNO	10m	8	Fiber	TC1
TX/RX	LC	TNF2LQM2	10m	8	Fiber	TC1
OUT/IN	LC	TNF2LQM2	10m	2	Fiber	TC1
TX/RX	LC	TMB1EMS10	10m	10	Fiber	TC1
TX/RX	LC	TMB1ELOM	10m	8	Fiber	TC1
OUT/IN	LC	TMB1ELOM	10m	2	Fiber	TC1
T/R	LC	TMK1TDC	10m	2	Fiber	TC2
T/R	LC	TMK1MDCA	10m	12	Fiber	TC2
OUT/IN	LC	TMK1MDCA	10m	1	Fiber	TC2
E1/T1	Anea96	TMB1TPS	10m	32	Shielded	TC2
OUT/IN	LC	TMK1UNS5	10m	1	Fiber	TC2
E&M	Anea96	TNW1AT8	10m	8	Shielded	TC3
E1	DB44	TNW1DXM	10m	4	Shielded	TC3
FXS/O	DB44	TNW1FXSO12	10m	12	Shielded	TC3
TX/RX	LC	TNF2LDX	10m	2	Fiber	TC4
OUT/IN	LC	TNF2LDX	10m	4	Fiber	TC4
TX/RX	LC	TNF2ELOM	10m	8	Fiber	TC4
OUT/IN	LC	TNF2ELOM	10m	2	Fiber	TC4
E1(120ohm)/T1	Anea96	TNF1SP3DA	10m	32	Shielded	TC4
TX/RX	LC	TMB1LDCD	10m	4	Fiber	TC4
OUT/IN	LC	TMB1LDCD	10m	2	Fiber	TC4

4.2 Auxiliary Equipment

Table 6 Auxiliary equipment

Equipment	Model	Manufacturer	S/N	Calibration Date	Calibration Interval (month)
Network Master Pro	MT1100A	Anritsu	A160810612	2019-11-21	12
SDH analyzer	MTS-5800 V2	JDSU	A160415503	2019-11-26	12
Personal Computer	R710	DELL	K3110040064	N/A	N/A

4.3 Test Configurations

The EUT was connected to auxiliary equipment in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).
There were four test configurations. The test configurations TC1-TC4 were shown in the following tables and figures:

Table 7 Test configuration

Configuration No.	Configuration Description
TC1	OptiXtrans E6608, DC Power Supply with TMK2UXCL/TMK2FAN/ TMB1PIU/TMB1SL16S/TMK1EX10/TMK1SLNO/TNF2LQM2/TMB1EMS10/TMB 1ELOM
TC2	OptiXtrans E6608, DC Power Supply with TMK2UXCL/TMK2FAN/ TMB1PIU/TMK1TDC/TMK1MDCA/TMB1TPS/TMK1UNS5
TC3	OptiXtrans E6608, DC Power Supply with TMK2UXCL/TMK2FAN/ TMB1PIU/TNW1DXM/TNW1FXSO12/TNW1AT8
TC4	OptiXtrans E6608, AC&DC Power Supply with TMK2UXCL/TMK2FAN/ TMB1APIU/TNF2LDX/TNF2ELOM/TNF1SP3DA/TMB1LDCD

<table>
<tr><td>TMK2UXCL</td><td>TMK2UXCL</td><td rowspan="2">TMB1PIU</td><td rowspan="4">TMK2FAN</td></tr>
<tr><td>TMB1SL16S</td><td>TMK1EX10</td></tr>
<tr><td>TMK1SLNO</td><td>TNF2LQM2</td><td rowspan="2">TMB1PIU</td></tr>
<tr><td>TMB1EMS10</td><td>TMB1ELOM</td></tr>
</table>

Figure 3.: Test configuration1 (TC1)

<table>
<tr><td>TMK2UXCL</td><td>TMK2UXCL</td><td rowspan="2">TMB1PIU</td><td rowspan="4">TMK2FAN</td></tr>
<tr><td>TMK1TDC</td><td rowspan="2">TMB1TPS</td></tr>
<tr><td rowspan="2">TMK1MDCA</td><td rowspan="2">TMB1PIU</td></tr>
<tr><td>TMK1UNS5</td></tr>
</table>

Figure 4.: Test configuration2 (TC2)

<table>
<tr><td>TMK2UXCL</td><td>TMK2UXCL</td><td rowspan="2">TMB1PIU</td><td rowspan="4">TMK2FAN</td></tr>
<tr><td>TNW1DXM</td><td>TNW1FXSO12</td></tr>
<tr><td>TNW1AT8</td><td>Blank Panel</td><td rowspan="2">TMB1PIU</td></tr>
<tr><td>Blank Panel</td><td>Blank Panel</td></tr>
</table>

Figure 5.: Test configuration3 (TC3)

<table>
<tr><td>TMK2UXCL</td><td>TMK2UXCL</td><td rowspan="2">Blank Panel</td><td rowspan="4">TMK2FAN</td></tr>
<tr><td>TNF2LDX</td><td>TNF2ELOM</td></tr>
<tr><td rowspan="2">TMB1APIU</td><td>TNF1SP3DA</td><td rowspan="2">Blank Panel</td></tr>
<tr><td>TMB1LDCD</td></tr>
</table>

Figure 6.: Test configuration4 (TC4)

4.4 Test Conditions and Connections

TC1:
GE: MT1100A<-->TMB1EMS10<-->TMB1ELOM<-->TMK1EX10<-->TNF2LQM2 <--> TMK1EX10<--
>TMB1ELOM<--> TMB1EMS10<--> MT1100A
STM-16: MT1100A<-->TMK1SLNO<-->TMK2UXCL<-->TMB1SL16S<-->TMK2UXCL<-->
TMK1SLNO <-->MT1100A

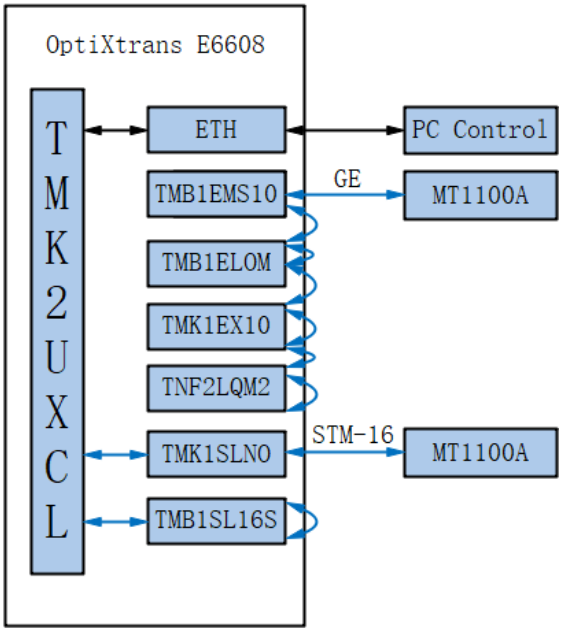


Figure 7.Test connection of TC1

TC2:
10GE:MT1100A<--> TMK1MDCA <-->MT1100A
40GE:MT1100A<-->TMK1MDCA<-->TMK1TDC<-->TMK2UXCL<-->TMK1UNS5<-->TMK2UXCL<-->TMK1TDC<--> MT1100A
TMB1TPS<-->TMB1TPS

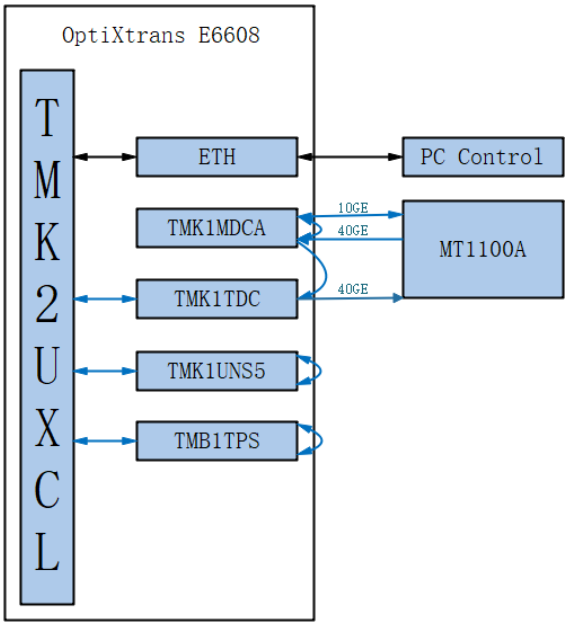


Figure 8. Test connection of TC2

TC3:
DDN: RS232<-->TNW1DXM<--> RS232
A-100<-->TNW1FXSO12<-->TNW1AT8<-->TNW1FXSO12<-->A-100

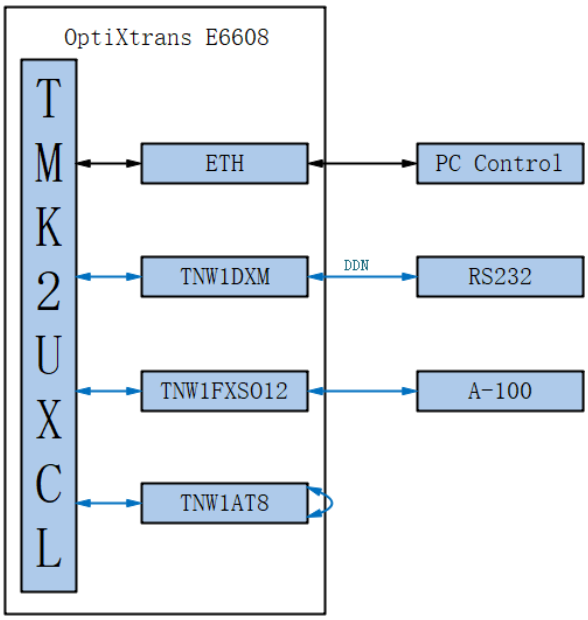


Figure 9. Test connection of TC3

TC4:
10GE: MT1100A<-->TNF2LDX<-->TNF2ELOM<-->TNF2LDX<-->MT1100A
E1: MT1100A<-->TNF1SP3DA<-->MT1100A
100GE: MT1100A<-->TMB1LDCD<-->MT1100A

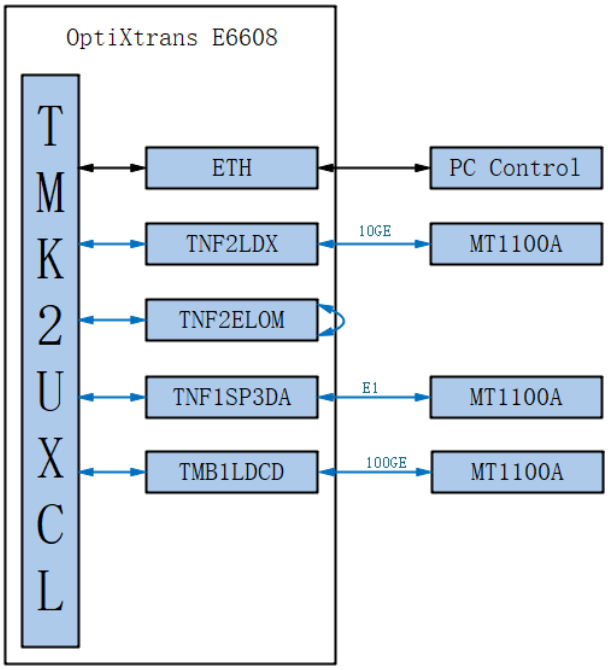


Figure 10. Test connection of TC4

5 Immunity Performance Criteria

During immunity test, the EUT is monitored for compliance against the performance criteria. The "pass / fail" performance criterion to be used during testing is detailed below:

5.1 Performance Criterion A

The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance.

- The digital ports, including Ethernet, series interfaces, shall be monitored throughout the test period for error frames and lost packets. The established connections shall be maintained throughout testing.
- For series interfaces (synchronous and asynchronous), the established connections shall be maintained throughout testing.
- For all optical ports shall be monitored throughout the test period. The established connections shall be maintained throughout test. And the transfer of information shall be without any bit errors during the exposure.

5.2 Performance Criterion B

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the exposure to an electromagnetic phenomenon, degradation of performance is, however, allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

The apparatus shall continue to operate as intended after the test. Degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

- For all optical ports, the loss of frame alignment and loss of signal are not allowed. SDH channel recover automatically after testing.
- For digital ports, including Ethernet, series interfaces (synchronous and asynchronous), and the established connections shall be maintained throughout testing. The EUT shall recover automatically to normal performance after the cessation of the exposure.

This performance does not apply to surge testing where some loss of frame alignment may be expected. For this test, the EUTshall operate as intended following the cessation of the exposure.

5.3 Performance Criterion C

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or, in the case of switching equipment, by normal subsequent use.

6 Electromagnetic Interference (EMI)

6.1 Radiated Emission 30 MHz to 6 GHz

6.1.1 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB in accordance with the standard CISPR 16-1-4. The test distance was 3 m for 30 MHz to 1 GHz.
The test site full-anechoic chamber has met the requirement of S_{VSWR} tolerance 6 dB in accordance with the standard CISPR 16-1-4. The test distance was 3 m for 1 GHz to 6 GHz.

A preliminary scan and a final scan of the emissions were made from 30 MHz to 6 GHz by using test software script; the emissions were measured using Quasi-Peak Detector (30 MHz to 1 GHz) and Average/Peak Detector (above 1 GHz). The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software set-up. Normally, the antenna height ranged from 1 m to 4 m, and the turntable azimuth ranged from 0°to 360°, The receive antenna has two polarizations: Vertical and Horizontal.

The set-up and test methods were in accordance with EN 55032/CISPR 32 standards. The test set-up diagram is shown as below:

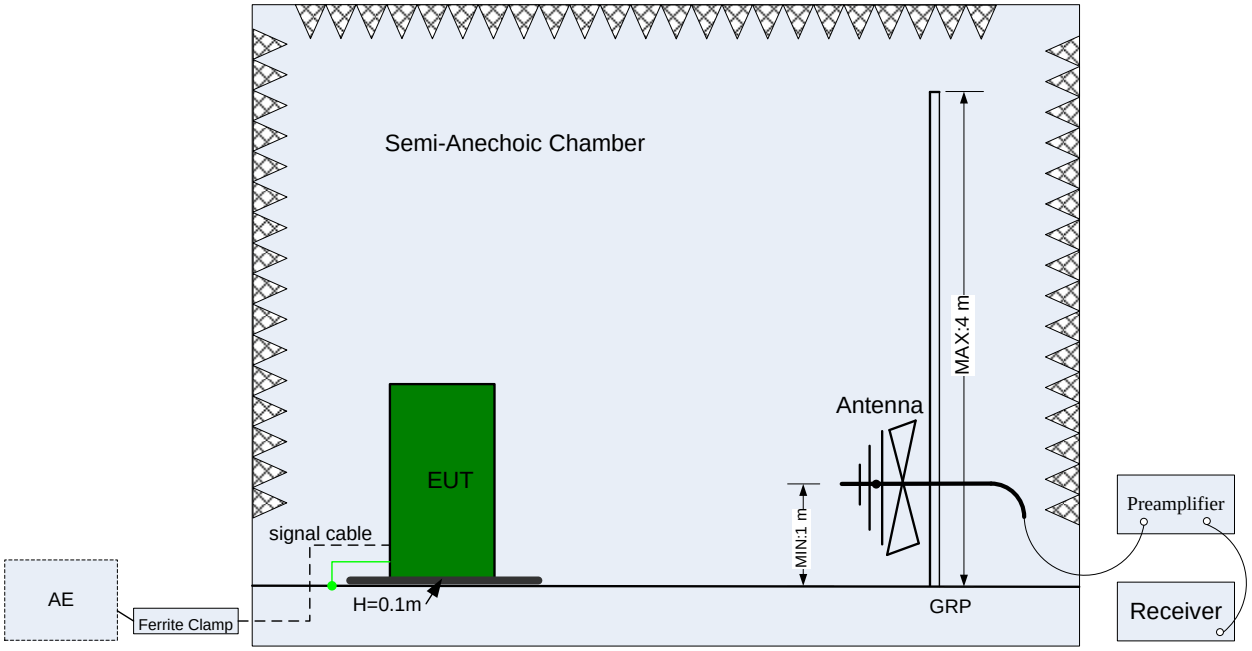


Figure 11. Test set-up of radiated disturbance (30 MHz to 1 GHz)

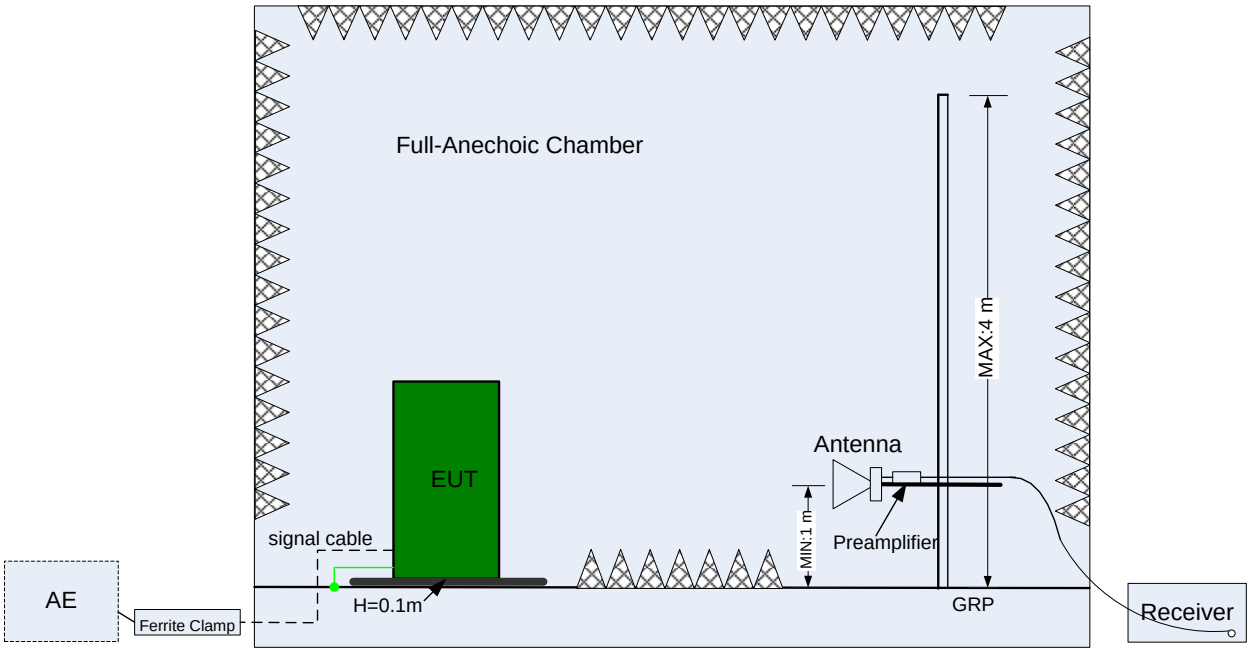


Figure 12. Test set-up of radiated disturbance (above 1 GHz)

6.1.2 Test Limit

Table 8 Test limits of 30 MHz to 1 GHz at a measuring distance of 3 m

Class A	
Frequency	Limit
30 MHz to 230 MHz	50 dBμV/m
230 MHz to 1 GHz	57 dBμV/m
Class B	
Frequency	Limit
30 MHz to 230 MHz	40 dBμV/m
230 MHz to 1 GHz	47 dBμV/m

Table 9 Test limits of 1 GHz to 6 GHz at a measuring distance of 3 m

Class A		
Frequency	AV	PK
1 GHz to 3 GHz	56 dBμV/m	76 dBμV/m
3 GHz to 6 GHz	60 dBμV/m	80 dBμV/m
Class B		
Frequency	AV	PK
1 GHz to 3 GHz	50 dBμV/m	70 dBμV/m
3 GHz to 6 GHz	54 dBμV/m	74 dBμV/m

6.1.3 Test Results

The EUT has met the requirements for radiated emission of the enclosure port.
For the test data, see section 10.1.

Table 10 Test Result

Test Configuration	Frequency Range	Distance(m)	Limit	Result
TC1-TC4	30 MHz to 1 GHz	3 m	Class A	Pass
TC1-TC4	1 GHz to 6 GHz	3 m	Class A	Pass

Note: The highest frequency of the internal sources of the EUT is 103.125 GHz; the measurement was made up to 6 GHz.

6.2 Conducted Emission 0.15 MHz to 30 MHz

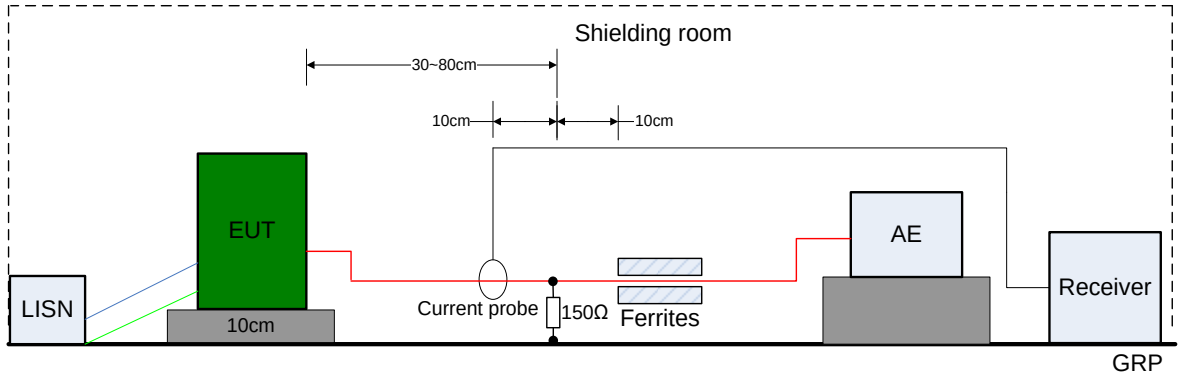
6.2.1 Test Procedure

The EUT was configured as described in section 4. The mains cable of the EUT must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8 m from the LISN.

All wired network and signal ports must be correctly terminated using either appropriate associated equipment or a representative termination during the measurement of the conducted disturbances at the mains.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

The set-up of conducted disturbance for wired network port and power ports were in accordance with EN 55032/CISPR 32 standards. The test set-up diagram is shown as below:



Note: The 150 Ω resistance was connected to the outside surface of the shield.

Figure 13. Test set-up of conducted disturbance for wired network port (shielded cable)

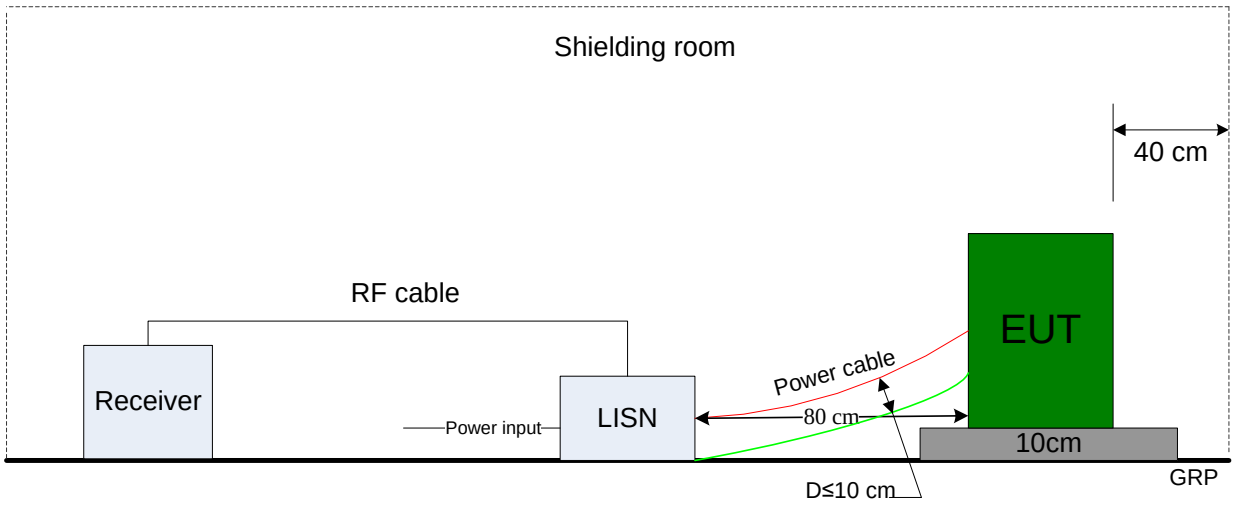


Figure 14. Test set-up of conducted disturbance for power port

6.2.2 Test Limit

Table 11 Limits of wired network ports

Class A				
Frequency	Voltage limits (dBμV)		Current limits (dBμA)	
	QP	AV	QP	AV
0.15 MHz to 0.5 MHz	97 to 87	84 to 74	53 to 43	40 to 30
0.5 MHz to 30 MHz	87	74	43	30

Table 12 Limits of DC&AC power port

Class A		
Frequency	Voltage limits (dBμV)	
	QP	AV
0.15 MHz to 0.5 MHz	79	66
0.5 MHz to 30 MHz	73	60

6.2.3 Test Results

The EUT has met requirements for conducted disturbance.
For the test data, see section 10.2.

Table 13 Test result of conducted disturbance

Test Configuration	Ports	Cable Type	Sampling Network	Limit	Result
TC1-TC4	DC	N/A	ENV4200	Class A	Pass
TC4	AC	N/A	ENV4200	Class A	Pass
TC1-TC4	ETH	Shielded	Current Probe	Class A	Pass
TC1-TC4	EXT	Shielded	Current Probe	Class A	Pass
TC2	E1/T1	Shielded	Current Probe	Class A	Pass
TC4	E1(120ohm)/T1	Shielded	Current Probe	Class A	Pass
TC3	E&M	Shielded	Current Probe	Class A	Pass
TC3	E1	Shielded	Current Probe	Class A	Pass
TC3	FXS/O	Shielded	Current Probe	Class A	Pass

6.3 Current Harmonics Emissions

6.3.1 Test Procedure

The EUT is to be powered from a clean (low distortion) 230 V, 50 Hz AC power source. The EUT was configured as described in section 4. The set-up and test methods were in accordance with EN 61000-3-2/IEC 61000-3-2 standards.

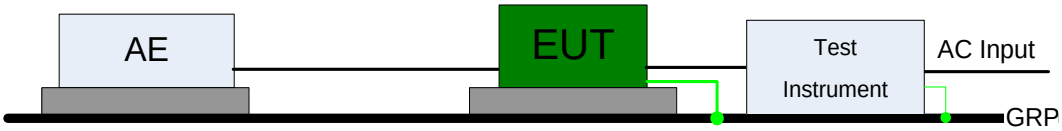


Figure 15. Test set-up of current harmonics emission test

6.3.2 Test Results

The EUT has met the requirements (Class A) specified in EN 61000-3-2/IEC 61000-3-2 for current harmonics emission of AC power port.

For the test data, see section 10.3.

6.4 Voltage Fluctuations and Flicker

6.4.1 Test Procedure

The EUT is to be powered from a clean (low distortion) 230 V, 50 Hz AC power source. The EUT was configured as described in section 4. The formal test ran a period of 2 hours. P_{lt}, P_{st}, d(t), d_{max} and d_c is measured. The set-up and test methods were in accordance with EN 61000-3-3/IEC 61000-3-3 standards.

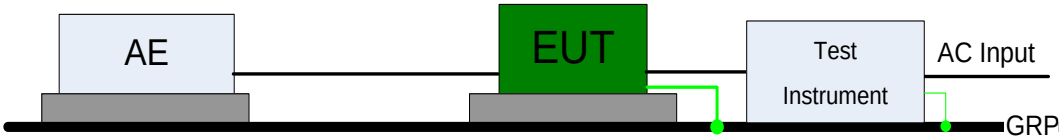


Figure 16. Test set-up of voltage fluctuations test

6.4.2 Test Results

The EUT has met the requirements of EN 61000-3-3/IEC 61000-3-3 for voltage fluctuations and flicker of AC power port.

For the test data, see section 10.4.

7 Electromagnetic Susceptibility (EMS)

7.1 Electrostatic Discharge

7.1.1 Test Procedure

The EUT was configured as described in section 4. The set-up and test methods were in accordance with IEC 61000-4-2 standard.

The test environment condition was recorded in the following table.

Table 14 Test environment condition during ESD test

Ambient temperature	25°C
Relative humidity	50%
Atmospheric pressure	95kPa

The test set-up diagram is shown as below:

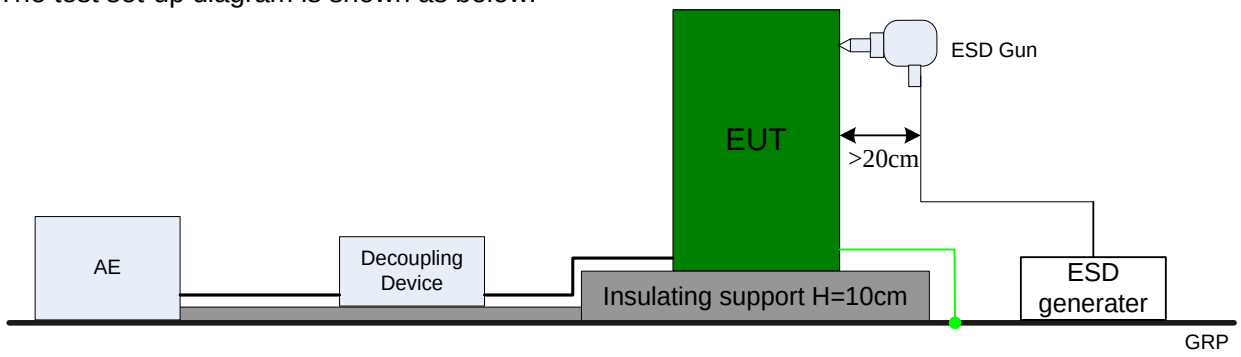


Figure 17. Test set-up of electrostatic discharge

7.1.2 Test Results

The EUT has met the requirements of Performance Criterion B defined in section 5.
All of the discharge points were presented in the table below. Each discharge point was tested 20 times (10 times respectively for positive and negative), and the minimum discharge interval was 1 second.

Table 15 Test results

Test Point	Discharge Mode	Test Level (kV)	Performance Criterion	Description	Result
Horizontal coupling plane-front	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Horizontal coupling plane-rear	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Horizontal coupling plane-left	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Horizontal coupling plane-right	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Vertical coupling plane-front	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Vertical coupling plane-rear	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Vertical coupling plane-left	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Vertical coupling plane-right	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Rack enclosure	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass

Connectors	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Screw of frames	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Board panels	C	±2, ±4, ±6, ±8	Criterion B	No failure detected	Pass
Board gap	A	±2, ±4, ±8, ±15	Criterion B	No failure detected	Pass
Radiator hole	A	±2, ±4, ±8, ±15	Criterion B	No failure detected	Pass
Indication lamp	A	±2, ±4, ±8, ±15	Criterion B	No failure detected	Pass

Note: The discharge mode: “C” means Contact Discharge, “A” means Air Discharge

7.2 Immunity to Radiated Electric Fields 80 MHz to 6000 MHz

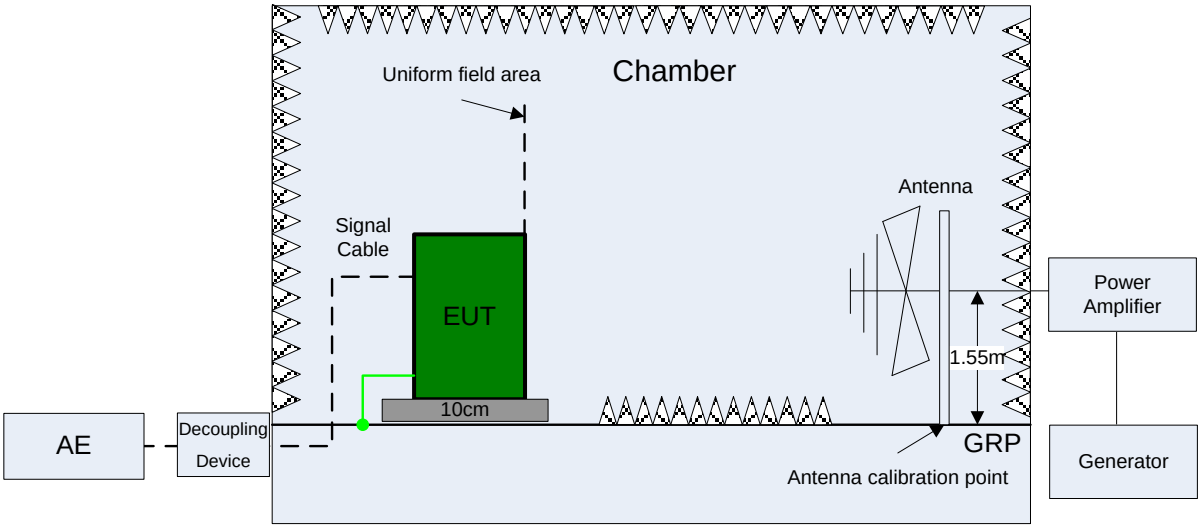
7.2.1 Test Procedure

The EUT was configured as described in section 4. The set-up and test methods were in accordance with IEC 61000-4-3 standard. All sides of the EUT (front, rear, left and right) were tested using an antenna with vertical and horizontal polarization.

Table 16 Test requirements

Test Side of EUT	Front, rear, left and right
Field Modulation	80% amplitude modulation at 1 kHz sine wave
Maximum Step Size	1%
Swept-Frequency Dwell Time	1 second
Special Frequency points	80 MHz, 120 MHz, 160 MHz; 230 MHz; 434 MHz; 460 MHz; 600 MHz; 863 MHz; 900 MHz (±1%).100 MHz; 155.52 MHz; 156.25 MHz; 312.5 MHz; 313.65 MHz; 50 MHz; 51 MHz; 100 MHz; 108 MHz; 125 MHz; 155.52 MHz; 156.25 MHz; 166.628 MHz; 312.5 MHz; 622.08 MHz; 1.25 GHz; 2.5 GHz;
Special Frequency Dwell Time	60 seconds

The test set-up diagram is shown as below:



Note: When performing the test above 2.7 GHz, the Horn Antenna will be used.

Figure 18. Test set-up of immunity to radiated electric fields

7.2.2 Test Results

The EUT has met the requirements of Performance Criterion A defined in section 5 for Immunity to radiated electromagnetic fields of enclosure port.

Table 17 Test results

Frequency Range	Polarization	Test Level (Unmodulated, rms)	Performance Criterion	Description	Result
80 MHz to 1000 MHz	Horizontal and Vertical	10 V/m (rms)	Criterion A	No failure detected	Pass
1000 MHz to 6000 MHz	Horizontal and Vertical	10 V/m (rms)	Criterion A	No failure detected	Pass

7.3 Immunity to Electrical Fast Transient Bursts

7.3.1 Test Procedure

The EUT was configured as described in section 4. A series of fast transient bursts meeting the specification were applied for a period of 120 seconds. The transient bursts were applied for both Positive and Negative Burst Trains to each type of signal port and power port. The set-up and test methods were in accordance with IEC 61000-4-4 standard.

Table 18 Parameter for single pulse and fast transient /burst

Rise Time of Single Pulse (Tr)	5 ns
Duration of Single Pulse (Th)	50 ns
Pulse Repetition Rate/ Burst Duration	5 kHz/15 ms
Burst Period	300 ms

The test set-up diagram is shown as below:

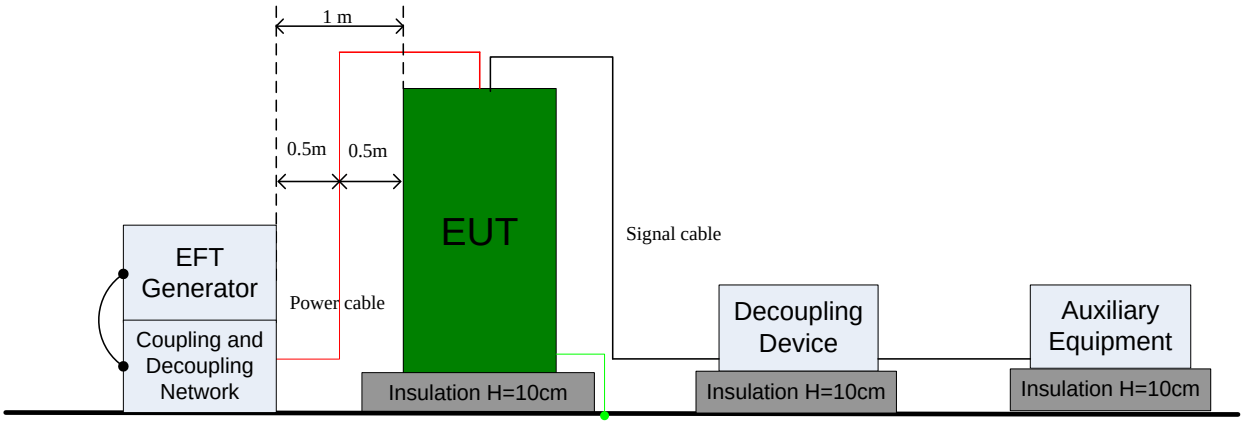


Figure 19. Test set-up of electrical fast transient bursts for power port of equipment with elevated cable entries

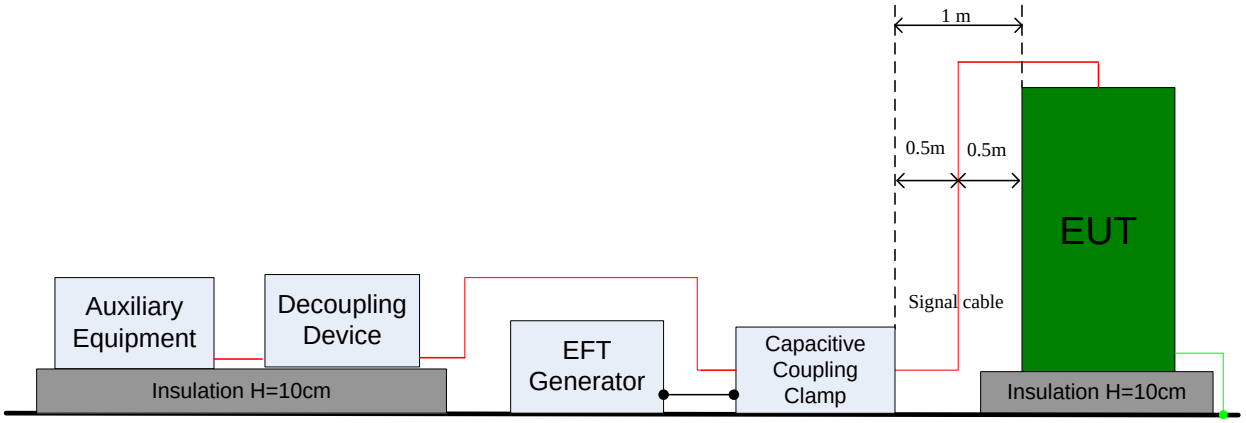


Figure 20. Test set-up of electrical fast transient bursts for signal port of equipment with elevated cable entries

7.3.2 Test Results

The EUT has met the requirements of Performance Criterion B defined in section 5.

Table 19 Test results

Ports	Coupling Mode	Test Level	Duration	Performance Criterion	Description	Result
AC	L	±2 kV	2 minutes	Criterion B	No failure detected	Pass
AC	N	±2 kV	2 minutes	Criterion B	No failure detected	Pass
AC	PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
AC	L+N	±2 kV	2 minutes	Criterion B	No failure detected	Pass
AC	L+PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
AC	N+PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
AC	L+N+PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	240V(+)	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	240V(-)	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	240V(+)+240V(-)	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	240V(+)+PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	240V(-)+PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	240V(+)+240V(-)+PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	-48V	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	RTN	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	-48V+RTN	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	RTN+PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	-48V+PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
DC	-48V+RTN+PE	±2 kV	2 minutes	Criterion B	No failure detected	Pass
ETH	Coupling clamp	±2 kV	2 minutes	Criterion B	No failure detected	Pass
EXT	Coupling clamp	±2 kV	2 minutes	Criterion B	No failure detected	Pass
E1/T1	Coupling clamp	±2 kV	2 minutes	Criterion B	No failure detected	Pass

E1(120ohm)/T1	Coupling clamp	±2 kV	2 minutes	Criterion B	No failure detected	Pass
E&M	Coupling clamp	±2 kV	2 minutes	Criterion B	No failure detected	Pass
E1	Coupling clamp	±2 kV	2 minutes	Criterion B	No failure detected	Pass
FXS/O	Coupling clamp	±2 kV	2 minutes	Criterion B	No failure detected	Pass

Note: RTN is short for return lead.

7.4 Immunity to Surges

7.4.1 Test Procedure

The EUT was configured as described in section 4. The set-up and test methods were in accordance with IEC 61000-4-5 standard.
The test set-up diagram is shown as below:

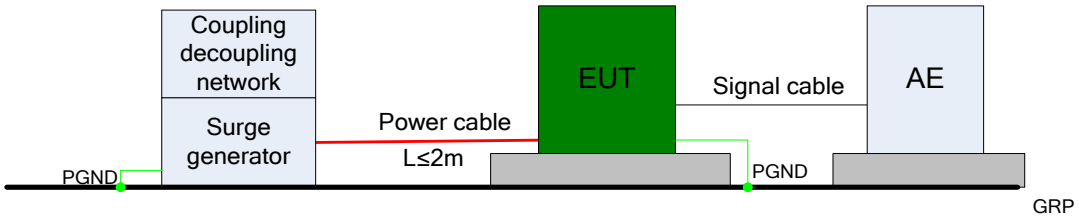


Figure 21. Test set-up of immunity to surge for power port

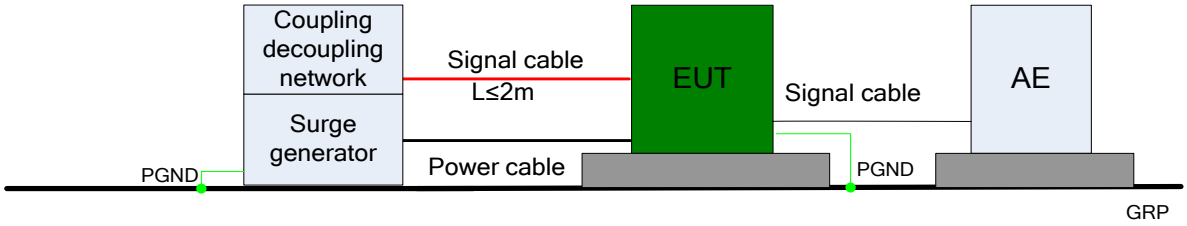


Figure 22. Test set-up of immunity to surge for signal port

7.4.2 Test Results

The EUT has met the requirements of Performance Criterion B defined in section 5.

Table 20 Test results

Ports	Waveform (μs)	Coupling Mode	Coupling Impedance (ohm)	Phase	Test Level	Rep Times	Description	Result
AC	1.2/50	L-N	2	0°, 90°, 180°, 270°	±2 kV	5	No failure detected	Pass
AC	1.2/50	L-PE	12	0°, 90°, 180°, 270°	±4 kV	5	No failure detected	Pass
AC	1.2/50	N-PE	12	0°, 90°, 180°, 270°	±4 kV	5	No failure detected	Pass
AC	1.2/50	L+N-PE	12	0°, 90°, 180°, 270°	±4 kV	5	No failure detected	Pass
DC	1.2/50	240V(+) to 240V(-)	2	Asyn	±2 kV	5	No failure detected	Pass
DC	1.2/50	240V(+) to ground	12	Asyn	±4 kV	5	No failure detected	Pass
DC	1.2/50	240V(-) to ground	12	Asyn	±4 kV	5	No failure detected	Pass
DC	1.2/50	240V(+)+ 240V(-) to ground	12	Asyn	±4 kV	5	No failure detected	Pass

DC	1.2/50	-48V to RTN	2	Asyn	±2 kV	5	No failure detected	Pass
DC	1.2/50	-48V to ground	12	Asyn	±4 kV	5	No failure detected	Pass
DC	1.2/50	RTN to ground	12	Asyn	±4 kV	5	No failure detected	Pass
DC	1.2/50	-48V+RTN to ground	12	Asyn	±4 kV	5	No failure detected	Pass
ETH	1.2/50	Line to ground	42	Asyn	±4 kV	5	No failure detected	Pass
ETH	1.2/50	Shield to ground	2	Asyn	±0.5 kV	5	No failure detected	Pass
EXT	1.2/50	Line to ground	42	Asyn	±4 kV	5	No failure detected	Pass
EXT	1.2/50	Shield to ground	2	Asyn	±0.5 kV	5	No failure detected	Pass
E1/T1	1.2/50	Line to Line	42	Asyn	±2 kV	5	No failure detected	Pass
E1/T1	1.2/50	Line to ground	42	Asyn	±2 kV	5	No failure detected	Pass
E1/T1	1.2/50	Shield to ground	2	Asyn	±0.5 kV	5	No failure detected	Pass
E1(120ohm)/T1	1.2/50	Line to ground	42	Asyn	±2 kV	5	No failure detected	Pass
E1(120ohm)/T1	1.2/50	Shield to ground	2	Asyn	±0.5 kV	5	No failure detected	Pass
E&M	1.2/50	Line to ground	42	Asyn	±2 kV	5	No failure detected	Pass
E&M	1.2/50	Shield to ground	2	Asyn	±0.5 kV	5	No failure detected	Pass
E1	1.2/50	Line to line	42	Asyn	±2 kV	5	No failure detected	Pass
E1	1.2/50	Line to ground	42	Asyn	±2 kV	5	No failure detected	Pass
E1	1.2/50	Shield to ground	2	Asyn	±0.5 kV	5	No failure detected	Pass
FXS/O	1.2/50	Line to ground	42	Asyn	±2 kV	5	No failure detected	Pass
FXS/O	1.2/50	Shield to ground	2	Asyn	±0.5 kV	5	No failure detected	Pass

Note: RTN is short for return lead.

7.5 Immunity to Continuous Conducted Interference 0.15 MHz to 80 MHz

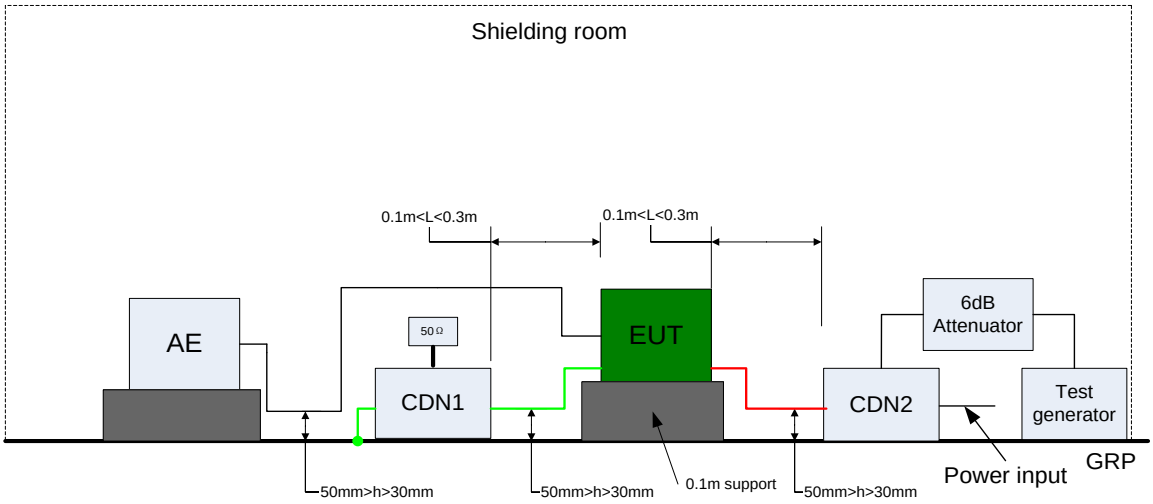
7.5.1 Test Procedure

The EUT was configured as described in section 4. The applied level was amplitude modulated by a 1 kHz sinusoidal signal to a modulation depth of 80%. The set-up and test methods were in accordance with IEC 61000-4-6 standard.

Table 21 Test requirements

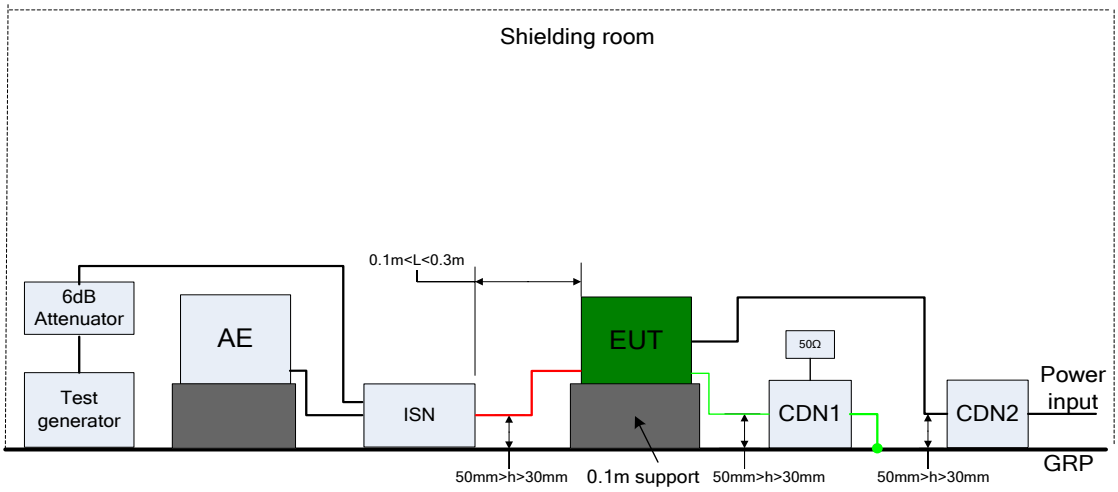
Sweep Frequency Range	0.15 MHz to 80 MHz
Field Modulation	80% amplitude modulation at 1kHz sine wave
Maximum Step Size	1%
Swept-Frequency Dwell Time	1 second
Special Frequency points	0.2 MHz; 1.0 MHz; 7.1 MHz; 13.56 MHz; 21.0 MHz; 27.12 MHz; 40.68 MHz (±1%); 2.048 MHz, 19.2 MHz, 25 MHz, 38.88 MHz, 50 MHz
Special Frequency Dwell Time	60 seconds

The test set-up diagram is shown as below:



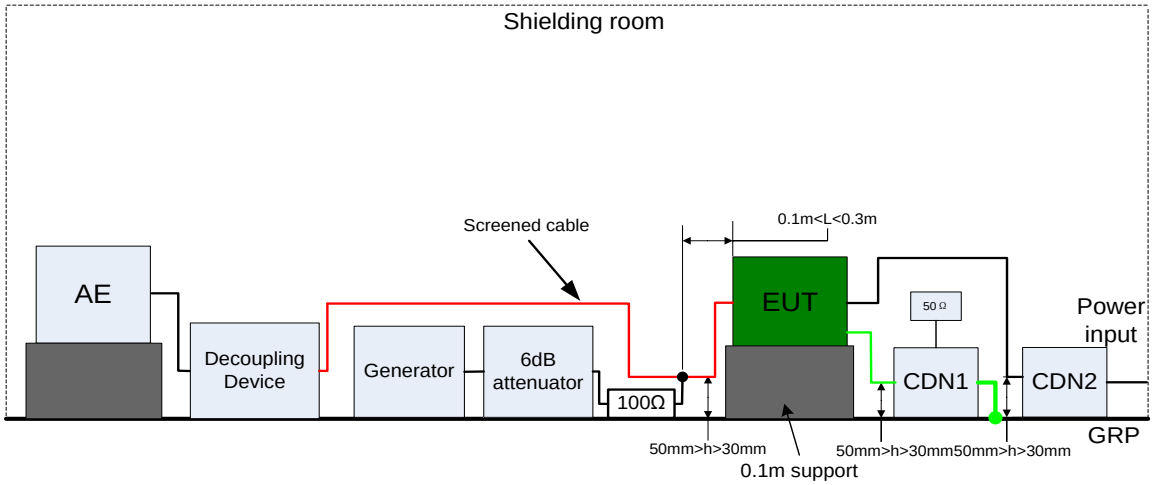
The cable connected to the EUT: red is power cable; green is earthing cable; black is signal cable

Figure 23. Test set-up of immunity to continuous conducted interference for power port



The cable connected to the EUT: red is screened signal cable; green is earth cable; black is power cable

Figure 24. Test set-up of immunity to continuous conducted interference for shielded cable



The cable connected to the EUT: red is screened signal cable; green is earth cable; black is power cable

Figure 25. Test set-up of immunity to continuous conducted interference for shielded cable

7.5.2 Test Results

The EUT has met the requirements of Performance Criterion A defined in section 5.

Table 22 Test results of signal ports

Port	Cable Type	Test Level (Unmodulated)	Coupling Method	Description	Conclusion
ETH	Shielded	10 V (rms)	CDN ST08A	No failure detected	Pass
EXT	Shielded	10 V (rms)	CDN ST08A	No failure detected	Pass
E1/T1	Shielded	10 V (rms)	Direct inject	No failure detected	Pass
E1(120ohm)/ T1	Shielded	10 V (rms)	Direct inject	No failure detected	Pass
E&M	Shielded	10 V (rms)	Direct inject	No failure detected	Pass
E1	Shielded	10 V (rms)	Direct inject	No failure detected	Pass
FXS/O	Shielded	10 V (rms)	Direct inject	No failure detected	Pass

Table 23 Test results of DC power port

Ports	Test Level (Unmodulated)	Inject Method	Description	Conclusion
DC power port	10 V (rms)	CDN-M2	No failure detected	Pass
Earthing	10 V (rms)	CDN-M1	No failure detected	Pass

Table 24 Test results of AC power port

Ports	Test Level (Unmodulated)	Inject Method	Description	Conclusion
AC power port	10 V (rms)	CDN-M3	No failure detected	Pass
Earthing	10 V (rms)	CDN-M1	No failure detected	Pass

7.6 Immunity to Power Frequency Magnetic Field

7.6.1 Test Procedure

The EUT was configured as described in section 4. The set-up and test methods were in accordance with IEC 61000-4-8 standard.

The test set-up diagram is shown as below:

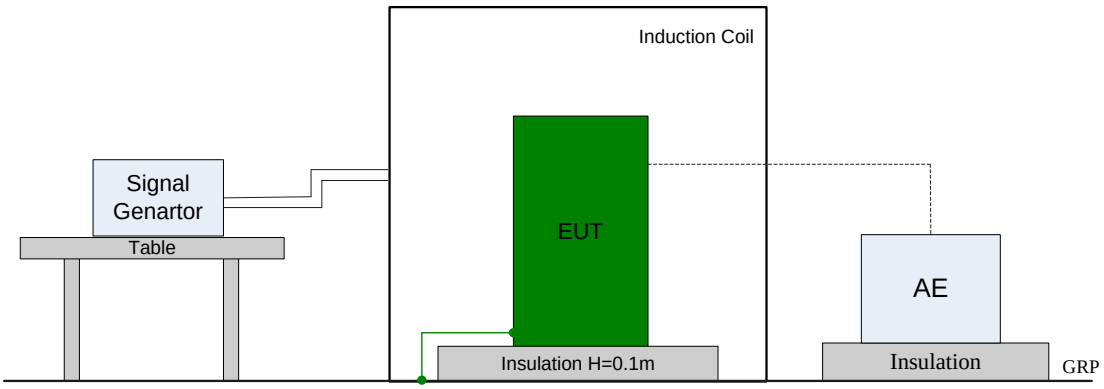


Figure 26. Test set-up of immunity to power frequency magnetic field

7.6.2 Test Results

The EUT has met the requirements of Performance Criterion A defined in section 5.

Table 25 Test results

Coil Position	Three orthogonal position X Y Z
Test Level	100 A/m &1000 A/m
Duration Time	1 min & 1 s
Criterion	Criterion A
Description	No failure detected
Conclusion	Pass

7.7 Immunity to Voltage Dips and Short Interruption of AC Power Port

7.7.1 Test Procedure

The EUT was configured as described in section 4. The set-up and test methods were in accordance with IEC 61000-4-11 standard.

The test set-up diagram is shown as below:

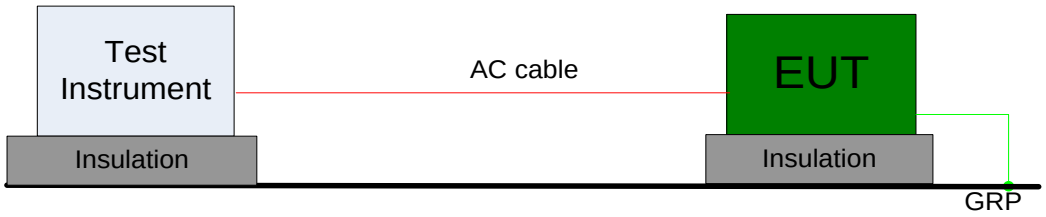


Figure 27. Test set-up of voltage dips and short interruption of AC power port

7.7.2 Test Results

The EUT has met the requirements of performance criterion defined in section 5.

Table 26 Test results of Voltage Dips and short interruptions of AC power port (without battery)

Normal Voltage	Dip to Ut	Duration	Interval	Phase	Rep Times	Performance Criterion	Phenomenon	Result
230 V	0%	10ms	10s	0º, 45º, 90º, 135º, 180º, 225º, 270º, 315º	3	Criterion B	No failure detected	Pass
230 V	0%	20ms	10s	0º, 45º, 90º, 135º, 180º, 225º, 270º, 315º	3	Criterion B	No failure detected	Pass
230 V	40%	200ms	10s	0º, 45º, 90º, 135º, 180º, 225º, 270º, 315º	3	Criterion C	No failure detected	Pass
230 V	70%	500ms	10s	0º, 45º, 90º, 135º, 180º, 225º, 270º, 315º	3	Criterion B	No failure detected	Pass
230 V	0%	5000ms	10s	0º, 45º, 90º, 135º, 180º, 225º, 270º, 315º	3	Criterion C	No failure detected	Pass

7.8 Immunity to Voltage Dips and Short Interruption and Voltage Variation of DC Power Port

7.8.1 Test Procedure

The EUT was configured as described in section 4. The set-up and test methods were in accordance with IEC 61000-4-29 standard.

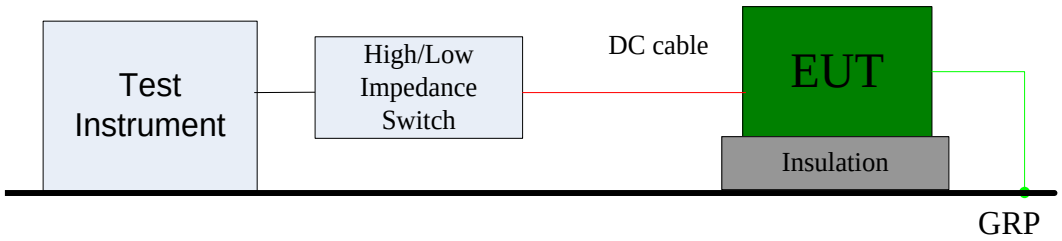


Figure 28. Test set-up of voltage dips and short interruption and voltage variation of DC power port

7.8.2 Test Results

The EUT has met the requirements performance criterion defined in section 5.

Table 27 Test results for -48V DC Power Port (without battery)

Test Items	Dip to Ut	Impedance	Duration	Rep. Times	Interval	Performance Criterion	Phenomenon	Result
Voltage Variation	120%	Low impedance	100ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	300ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	1s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	3s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	10s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	100ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	300ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	1s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	3s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	10s	3	10s	Criterion A	No failure detected	Pass
Voltage DIPs	70%	Low impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	100ms	3	10s	Criterion C	No failure detected	Pass

Voltage DIPs	70%	Low impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	1s	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	1s	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	1s	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	1s	3	10s	Criterion C	No failure detected	Pass

Table 28 Test results for -60V DC Power Port (without battery)

Test Items	Dip to Ut	Impedance	Duration	Rep. Times	Interval	Performance Criterion	Phenomenon	Result
Voltage Variation	120%	Low impedance	100ms	3	10s	Criterion A	No failure detected	Pass

Voltage Variation	120%	Low impedance	300ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	1s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	3s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	10s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	100ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	300ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	1s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	3s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	10s	3	10s	Criterion A	No failure detected	Pass
Voltage DIPs	70%	Low impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	1s	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	1s	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	10ms	3	10s	Criterion C	No failure detected	Pass

Short interruption	0%	Low impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	1s	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	1s	3	10s	Criterion C	No failure detected	Pass

Table 29 Test results for 240V DC Power Port (without battery)

Test Items	Dip to Ut	Impedance	Duration	Rep. Times	Interval	Performance Criterion	Phenomenon	Result
Voltage Variation	120%	Low impedance	100ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	300ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	1s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	3s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	120%	Low impedance	10s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	100ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	300ms	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	1s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	3s	3	10s	Criterion A	No failure detected	Pass
Voltage Variation	80%	Low impedance	10s	3	10s	Criterion A	No failure detected	Pass
Voltage DIPs	70%	Low impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	10ms	3	10s	Criterion C	No failure detected	Pass

Voltage DIPs	70%	Low impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	70%	Low impedance	1s	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Voltage DIPs	40%	Low impedance	1s	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	Low impedance	1s	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	1ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	3ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	10ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	30ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	100ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	300ms	3	10s	Criterion C	No failure detected	Pass
Short interruption	0%	High impedance	1s	3	10s	Criterion C	No failure detected	Pass

8 Main Test Instruments

Table 30 Main test instruments

Test item	Test Instrument	Model (S/N)	Manufacturer	Calibration Date	Calibration Interval (month)
Radiated emission (Location1)	EMI test receiver	N9038A (MY52260169)	Keysight	2020-04-17	12
	Spectrum analyzer	N9010A (MY52220816)	Keysight	2020-04-18	12
	Bilog antenna	CBL 6112D (35239)	TESEQ	2019-03-21	24
	Horn antenna (1GHz~18GHz)	BBHA 9120D (1078)	SWARZBECK	2019-10-25	24
	Chamber _NSA	3m chamber	Albatross	2019-11-16	24
	Chamber _S_{VSWR}	3m chamber	Albatross	2019-11-16	24
Conducted emission (Location1)	EMI test receiver	ESR (101823)	R&S	2020-04-17	12
	Artificial mains network	ENV4200 (100063)	R&S	2020-04-18	12
	Current probe	EZ-17 (101405)	R&S	2019-11-23	12
Current Harmonics Voltage fluctuation and Flicker (Location1)	AC source	ACS 500N6 (V1234113471)	EMTEST	2020-04-20	12
	Flicker impedance	AIF503N16 (V1234113470)	EMTEST	2020-04-20	12
	Harmonics and flickers analyzer	DPA 503N (V1234113469)	EMTEST	2020-04-20	12
Electrostatic discharge (Location1)	ESD simulator	SESD30000 (607171)	SCHLODER	2019-10-16	12
Immunity to radiated electric fields (Location1)	Signal generator	N5183A (MY50141961)	Keysight	2020-04-18	15
	Broadband antenna	STLP 9120D (9128D-058)	SWARZBECK	N/A	N/A
	Broadband antenna	STLP 9149 (9149-421)	SWARZBECK	N/A	N/A
	Amplifier	80RF1000-500 (1054961)	MILMEGA	2020-04-17	12
	Amplifier	AS0827-230 (1054966)	MILMEGA	2020-04-17	12
	Amplifier	NTWPAS-2060100 (16099049)	Rflight	2020-04-17	12
Electrical fast transient bursts (Location1)	Fast transient burst simulator	NSG3060 (169)	TESEQ	2020-06-20	12
	Coupling clamp	CDN 8014 (28088)	TESEQ	2020-06-20	12
SURGE (Location1)	1.2/50 high energy pulse generator	NSG3060 (1078)	TESEQ	2020-04-19	12
Immunity to continuous conducted interference	Signal generator	NSG4070 (26991)	TESEQ	2020-04-16	12
	6dB attenuator	ATN 6075 (27167)	TESEQ	2020-04-16	12

(Location1)	Coupling decoupling network	CDN M016 (27449)	TESEQ	2020-04-16	12
	Coupling decoupling network	FCC-801-M1-50A (09897)	FCC	2020-04-18	12
	100 ohms resistance	CR 100A (314)	TESEQ	2020-04-16	12
	Coupling decoupling network	CDN ST08A (51383)	TESEQ	2020-04-17	12
Voltage Dips, short Interruptions, and Voltage Variations of DC Power Ports (Location1)	Programmable power	PCR9000LE (XE002767)	KIKUSUI	2020-04-19	12
Voltage dips and short interruptions of AC power ports (Location1)	Programmable power	PCR9000LE (XE002767)	KIKUSUI	2020-04-19	12
	Auto step transformer	DSI 1020 (XG001499)	KIKUSUI	2020-04-19	12
Immunity to Power Frequency Magnetic Field (Location3)	Power Frequency Magnetic field Generator	SKS-0805T	SANKI	2019-07-30	12
	Coil	E2019041901	EMTEST	2019-08-04	12

Software Information			
Test Item	Software Name	Manufacturer	Version
Radiated emission	EP5	TOYO	V5.5
Conducted emission	EMC32	R&S	V8.54
Immunity to radiated electric fields	JS35	Tonscend	V2.0.1.4
Immunity to continuous conducted interference	NSG4070_ control	TESEQ	V1.1.1
Voltage dips, short interruptions, and voltage variations of DC power ports	DC.Quik immunity sequencer	KIKUSUI	V1.02
Voltage dips, short interruptions of AC power ports	AC.Quik immunity sequencer	KIKUSUI	V1.02
Current harmonics & voltage fluctuations and flickers	dpa.control	EMTEST	V5.3.1

9 System Measurement Uncertainty

For a 95% confidence level, the measurement extended uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

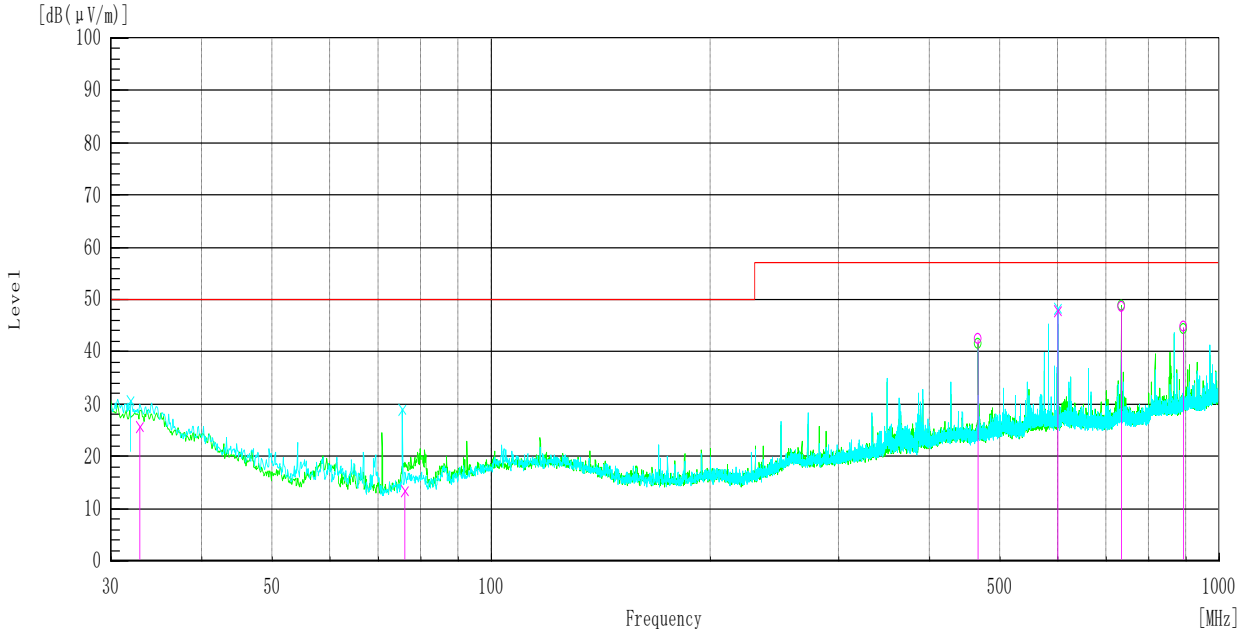
Table 31 System measurement uncertainty

Items		Extended Uncertainty
Radiated emission	Field strength (dBμV/m)	*U*=5.2 dB; *k*=2 (30 MHz to 1 GHz)
		U=4.6 dB; *k*=2 (1 GHz to 6 GHz)
Conducted emission	Disturbance voltage (dBμV)	*U*=2.9 dB; *k*=2 (LISN) *U*=2.7 dB; *k*=2 (Current Probe)
Harmonic current emission	I (A)	*U*=9.9%; *k*=2
Voltage fluctuations and flicker	Pst	*U*=5.9%; *k*=2
	Plt	*U*=5.9%; *k*=2
	dc	*U*=1.2%; *k*=2
	dmax	*U*=5.2%; *k*=2
	dt	*U*=1.2%; *k*=2

10 Graph and Data of Emission Test

10.1 Radiated Disturbance of TC1-TC4

30 MHz to 1 GHz:
For DC -48V:

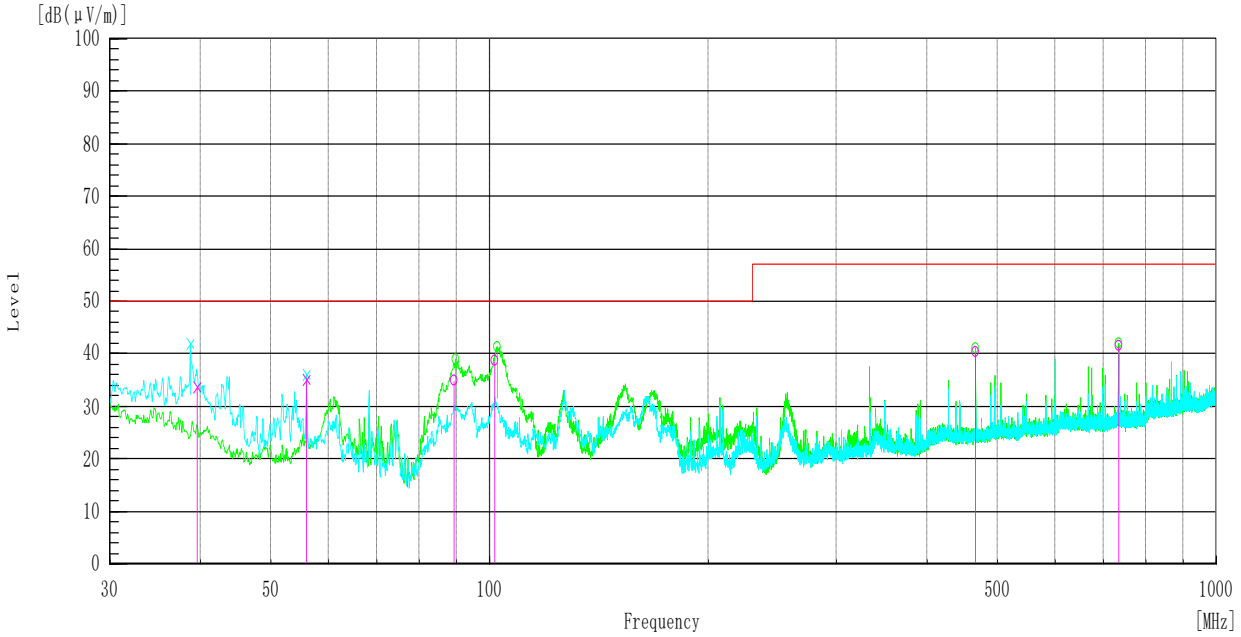


Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]	Remark
1	32.895	V	40.4	-14.6	25.8	50.0	24.2	118.0	314.0	
2	75.974	V	38.5	-25.0	13.5	50.0	36.5	203.0	54.0	
3	466.670	H	55.2	-12.8	42.4	57.0	14.6	220.0	94.0	
4	599.994	V	58.7	-10.7	48.0	57.0	9.0	101.0	121.0	
5	733.331	H	58.4	-9.7	48.7	57.0	8.3	101.0	311.0	
6	894.240	H	51.8	-7.0	44.8	57.0	12.2	101.0	26.0	

Note:
1. Margin=Limit-Result
Result=Reading level by receiver + c.f (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.
2. The DC -48V test configurations of TC1-TC3 were tested, and the worst test result was supplied.

For AC 230V:

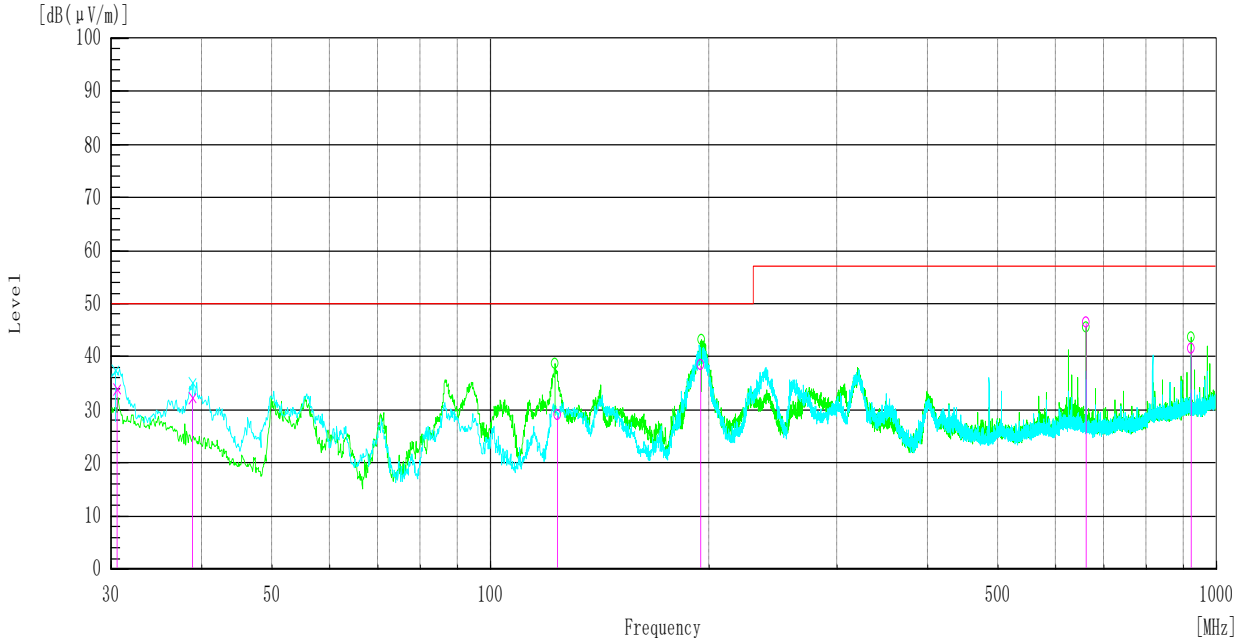


Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]	Remark
1	39.546	V	51.6	-17.8	33.8	50.0	16.2	100.0	261.0	
2	55.928	V	60.3	-25.1	35.2	50.0	14.8	100.0	323.0	
3	89.346	H	57.5	-22.6	34.9	50.0	15.1	187.0	347.0	
4	101.640	H	58.6	-20.0	38.6	50.0	11.4	156.0	359.0	
5	466.677	H	53.2	-12.8	40.4	57.0	16.6	184.0	325.0	
6	733.345	H	51.2	-9.7	41.5	57.0	15.5	101.0	26.0	

Note:
Margin=Limit-Result
Result=Reading level by receiver + c.f (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.

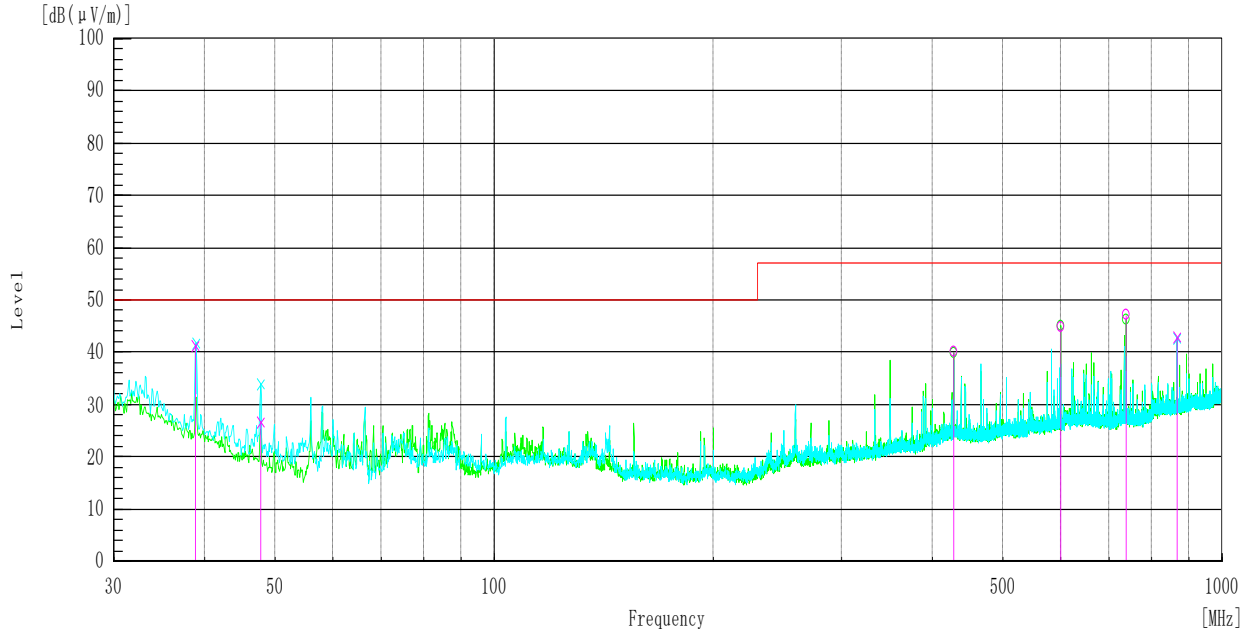
For AC 110V:



No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]	Remark
1	30.590	V	47.6	-13.6	34.0	50.0	16.0	100.0	1.0	
2	38.878	V	49.7	-17.5	32.2	50.0	17.8	100.0	133.0	
3	123.706	H	47.9	-18.8	29.1	50.0	20.9	133.0	359.0	
4	194.433	H	59.7	-21.2	38.5	50.0	11.5	199.0	124.0	
5	660.957	H	57.3	-10.8	46.5	57.0	10.5	102.0	311.0	
6	923.415	H	48.3	-6.7	41.6	57.0	15.4	139.0	20.0	

Note:
Margin=Limit-Result
Result=Reading level by receiver + c.f (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.

For HVDC 240V:

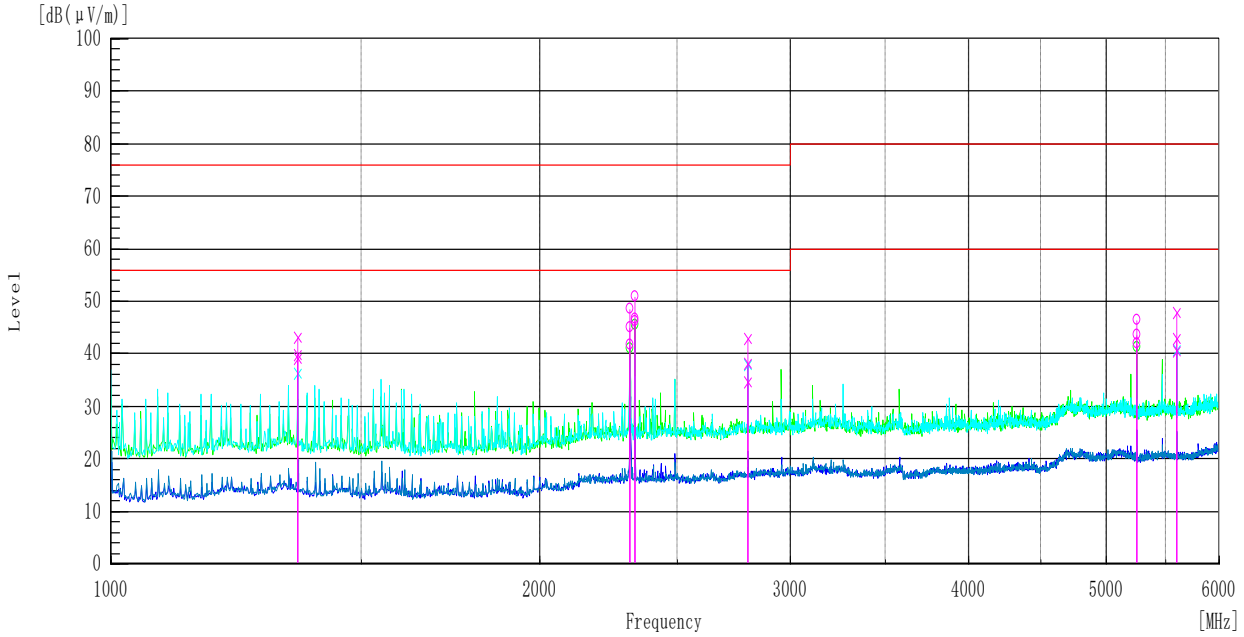


Final Result

No.	Frequency	(P)	Reading QP	c.f	Result QP	Limit QP	Margin QP	Height	Angle	Remark
	[MHz]		[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	[cm]	[°]	
1	38.876	V	58.7	-17.5	41.2	50.0	8.8	100.0	83.0	
2	47.748	V	48.8	-22.2	26.6	50.0	23.4	100.0	129.0	
3	427.684	H	52.7	-12.7	40.0	57.0	17.0	192.0	159.0	
4	600.006	H	55.5	-10.7	44.8	57.0	12.2	103.0	107.0	
5	738.725	H	57.0	-9.8	47.2	57.0	9.8	100.0	31.0	
6	866.665	V	50.3	-7.5	42.8	57.0	14.2	130.0	161.0	

Note:
Margin=Limit-Result
Result=Reading level by receiver + c.f (Antenna factor + cable loss – preamplifier gain)
The reading level is used to calculate by software which is not shown in the sheet.

1 GHz to 6 GHz:



Final Result

No.	Frequency	(P)	Reading PK	Reading CAV	Reading AV	c.f	Result PK	Result CAV	Result AV	Limit PK	Limit AV	Margin PK	Margin CAV	Height	Angle	Remark
	[MHz]		[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	[dB]	[cm]	[°]	
1	1351.902	V	57.9	54.0	54.8	-14.9	43.0	39.1	39.9	76.0	56.0	33.0	16.9	118.0	25.0	
2	2313.579	H	60.2	53.3	56.6	-11.6	48.6	41.7	45.0	76.0	56.0	27.4	14.3	163.0	31.0	
3	2332.831	H	62.6	58.3	57.7	-11.6	51.0	46.7	46.1	76.0	56.0	25.0	9.3	154.0	87.0	
4	2800.189	V	52.6	44.3	47.8	-9.6	43.0	34.7	38.2	76.0	56.0	33.0	21.3	152.0	42.0	
5	5250.005	H	49.9	45.2	47.0	-3.3	46.6	41.9	43.7	80.0	60.0	33.4	18.1	100.0	26.0	
6	5600.138	V	50.9	43.5	45.9	-2.9	48.0	40.6	43.0	80.0	60.0	32.0	19.4	106.0	20.0	

Note:

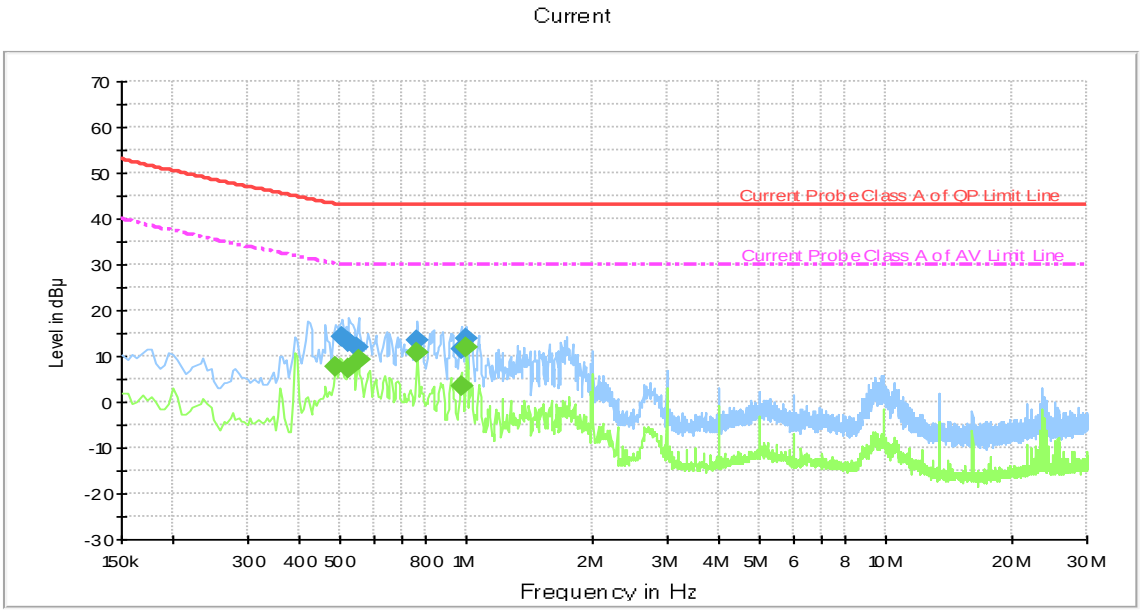
1. Margin=Limit-Result

Result=Reading level by receiver + c.f (Antenna factor + cable loss – preamplifier gain)

2. All power supply modes of TC1-TC4 test configurations were tested, and the worst test result was supplied.

10.2 Conducted Disturbance

10.2.1 ETH Port Test Data



Measurement Result: QP Detector

Frequency (MHz)	QuasiPeak (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.501000	14.1	43.0	28.9	1000.0	9.000	-3.3
0.523500	13.1	43.0	29.9	1000.0	9.000	-3.5
0.546000	11.8	43.0	31.2	1000.0	9.000	-3.7
0.762000	13.3	43.0	29.7	1000.0	9.000	-5.4
0.973845	11.7	43.0	31.3	1000.0	9.000	-6.7
0.995520	14.0	43.0	29.0	1000.0	9.000	-6.9

Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.483000	7.7	30.2	22.5	1000.0	9.000	-3.1
0.523500	7.5	30.0	22.5	1000.0	9.000	-3.5
0.550500	9.4	30.0	20.6	1000.0	9.000	-3.8
0.762000	10.7	30.0	19.3	1000.0	9.000	-5.4
0.973845	3.5	30.0	26.5	1000.0	9.000	-6.7
0.995520	11.8	30.0	18.2	1000.0	9.000	-6.9

Note:

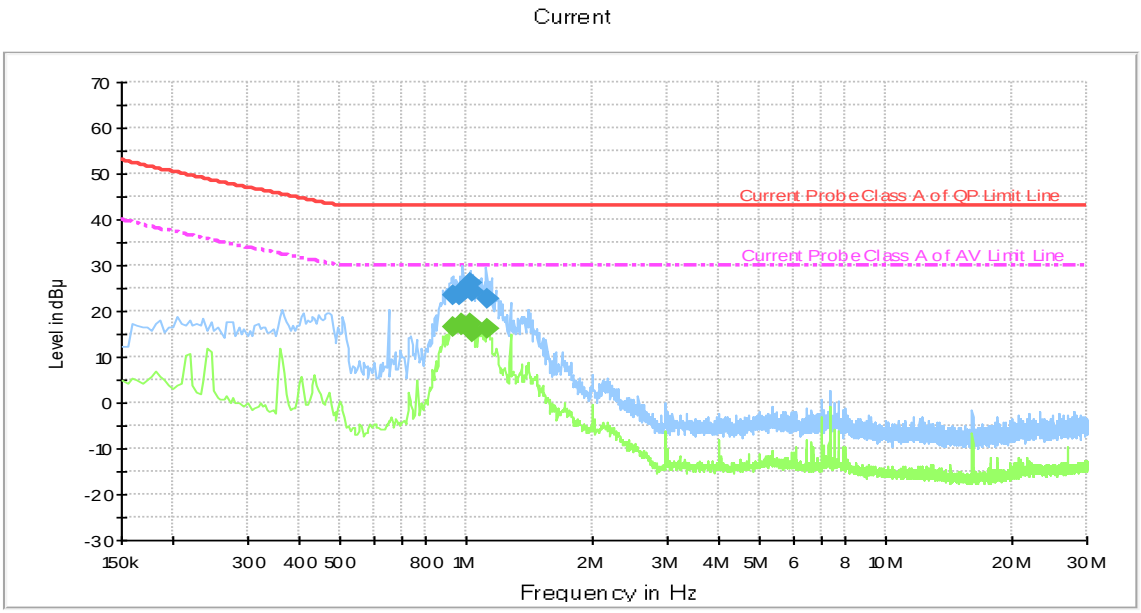
1. Margin=Limit- Level (QuasiPeak /CAverage)

Level= Reading level+ Corr. (cable loss + correction factor)

The reading level is used to calculate by software which is not shown in the sheet.

2. The test configurations of TC1-TC4 were tested, and the worst test result was supplied.

10.2.2 EXT Port Test Data



Measurement Result: QP Detector

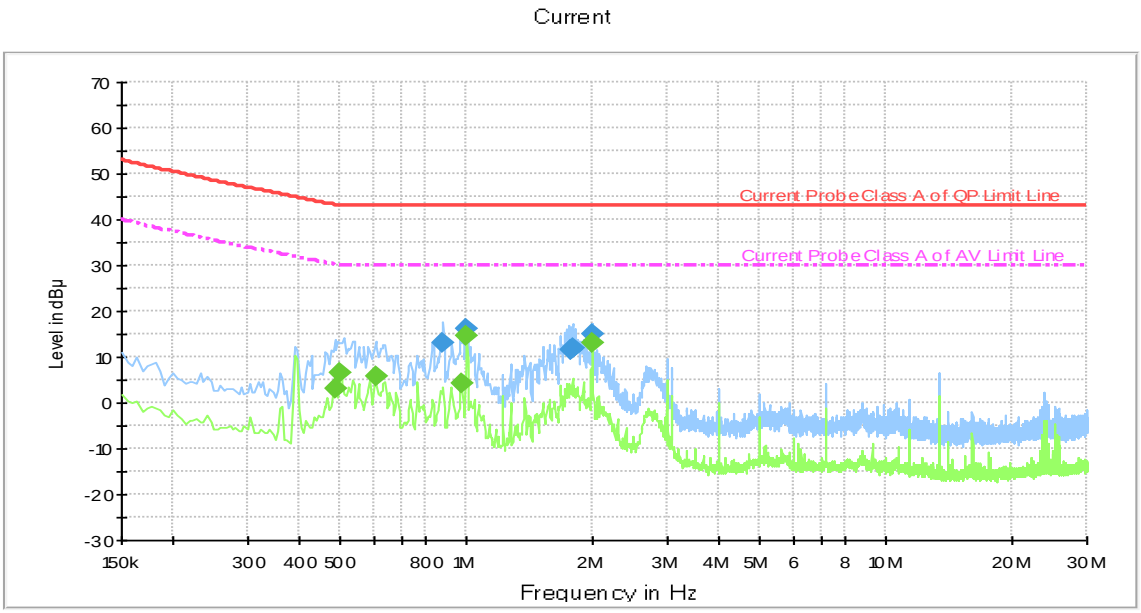
Frequency (MHz)	QuasiPeak (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.923880	23.6	43.0	19.4	1000.0	9.000	-6.4
0.964200	23.5	43.0	19.5	1000.0	9.000	-6.7
0.973132	24.3	43.0	18.7	1000.0	9.000	-6.7
1.017908	26.1	43.0	16.9	1000.0	9.000	-6.9
1.031340	24.4	43.0	18.6	1000.0	9.000	-7.0
1.114043	22.8	43.0	20.2	1000.0	9.000	-7.1

Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.923880	16.4	30.0	13.6	1000.0	9.000	-6.4
0.968632	17.2	30.0	12.8	1000.0	9.000	-6.7
0.968678	16.9	30.0	13.1	1000.0	9.000	-6.7
1.017908	17.2	30.0	12.8	1000.0	9.000	-6.9
1.035840	15.5	30.0	14.5	1000.0	9.000	-7.0
1.111958	16.2	30.0	13.8	1000.0	9.000	-7.1

Note:
1. Margin=Limit- Level (QuasiPeak /CAverage)
Level= Reading level+ Corr. (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.
2. The test configurations of TC1-TC4 were tested, and the worst test result was supplied.

10.2.3 E1/T1 Test Data



Measurement Result: QP Detector

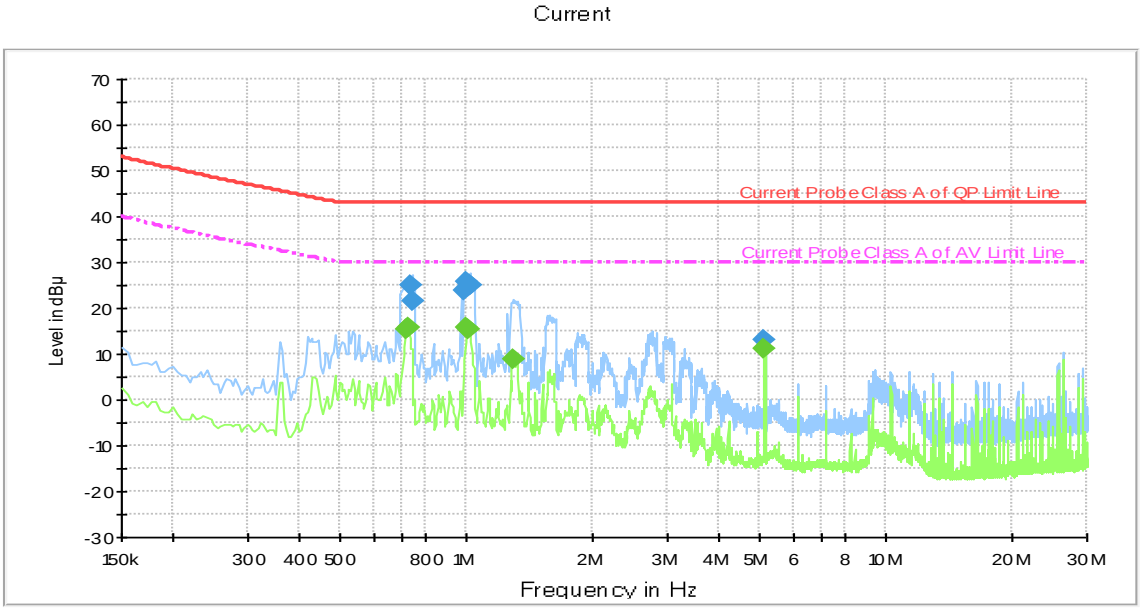
Frequency (MHz)	QuasiPeak (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.874500	13.1	43.0	29.9	1000.0	9.000	-6.1
0.995520	16.3	43.0	26.7	1000.0	9.000	-6.9
1.765283	11.6	43.0	31.4	1000.0	9.000	-8.2
1.765672	11.5	43.0	31.5	1000.0	9.000	-8.2
1.787895	11.8	43.0	31.2	1000.0	9.000	-8.2
1.994025	15.0	43.0	28.0	1000.0	9.000	-8.5

Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.483000	3.2	30.2	27.1	1000.0	9.000	-3.1
0.496500	6.5	30.1	23.6	1000.0	9.000	-3.3
0.604500	5.6	30.0	24.4	1000.0	9.000	-4.2
0.968678	4.1	30.0	25.9	1000.0	9.000	-6.7
0.995520	14.5	30.0	15.5	1000.0	9.000	-6.9
1.994048	13.2	30.0	16.8	1000.0	9.000	-8.5

Note:
Margin=Limit- Level (QuasiPeak /CAverage)
Level= Reading level+ Corr. (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

10.2.4 E1(120ohm)/T1 Test Data



Measurement Result: QP Detector

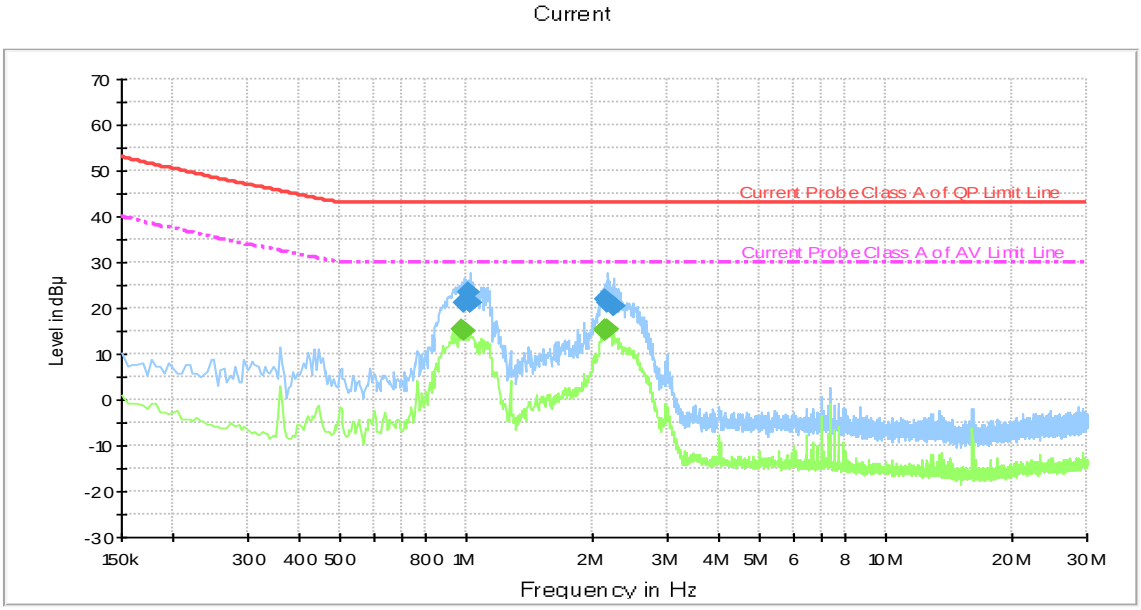
Frequency (MHz)	QuasiPeak (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.735000	25.0	43.0	18.0	1000.0	9.000	-5.2
0.744000	21.6	43.0	21.4	1000.0	9.000	-5.2
0.977588	24.0	43.0	19.0	1000.0	9.000	-6.8
0.995520	25.6	43.0	17.4	1000.0	9.000	-6.9
1.013430	25.2	43.0	17.8	1000.0	9.000	-6.9
5.119410	13.1	43.0	29.9	1000.0	9.000	-9.2

Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.717000	15.5	30.0	14.5	1000.0	9.000	-5.1
0.721499	15.7	30.0	14.3	1000.0	9.000	-5.1
0.995498	15.6	30.0	14.4	1000.0	9.000	-6.9
1.008930	15.4	30.0	14.6	1000.0	9.000	-6.9
1.294943	8.8	30.0	21.2	1000.0	9.000	-7.5
5.119410	11.0	30.0	19.0	1000.0	9.000	-9.2

Note:
Margin=Limit- Level (QuasiPeak /CAverage)
Level= Reading level+ Corr. (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

10.2.5 E&M Test Data



Measurement Result: QP Detector

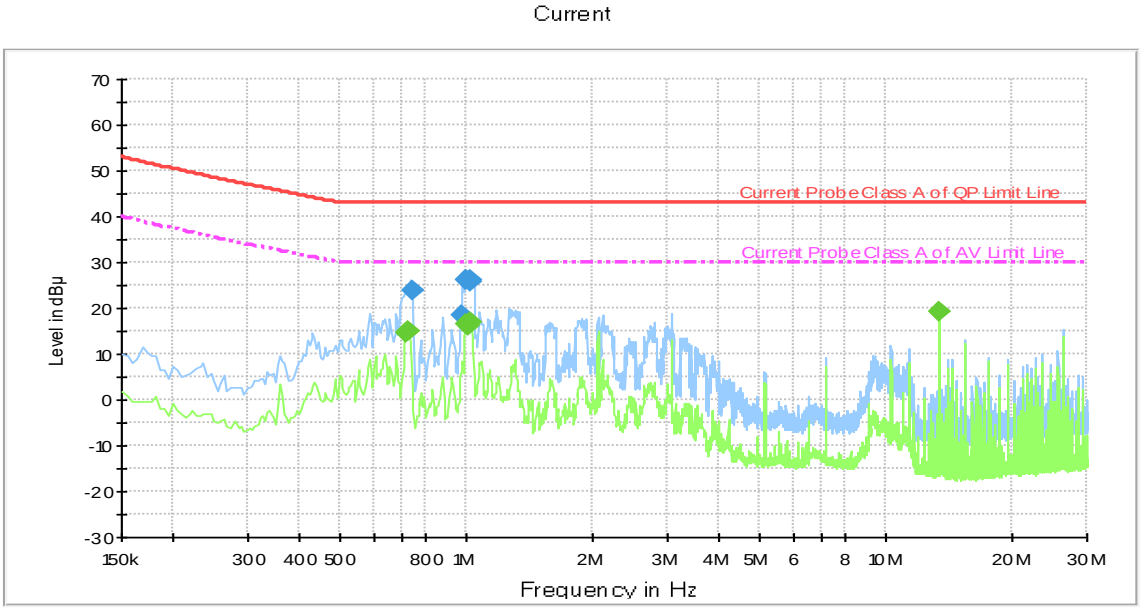
Frequency (MHz)	QuasiPeak (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.986565	21.3	43.0	21.7	1000.0	9.000	-6.8
1.004475	23.3	43.0	19.7	1000.0	9.000	-6.9
1.013408	21.3	43.0	21.7	1000.0	9.000	-6.9
2.141760	21.7	43.0	21.3	1000.0	9.000	-8.5
2.164170	21.0	43.0	22.0	1000.0	9.000	-8.5
2.244810	20.3	43.0	22.7	1000.0	9.000	-8.6

Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.968632	15.4	30.0	14.6	1000.0	9.000	-6.7
0.986565	15.0	30.0	15.0	1000.0	9.000	-6.8
2.132872	15.5	30.0	14.5	1000.0	9.000	-8.5
2.146215	15.1	30.0	14.9	1000.0	9.000	-8.5
2.146260	15.3	30.0	14.7	1000.0	9.000	-8.5
2.159670	15.2	30.0	14.8	1000.0	9.000	-8.5

Note:
Margin=Limit- Level (QuasiPeak /CAverage)
Level= Reading level+ Corr. (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

10.2.6 E1 Test Data



Measurement Result: QP Detector

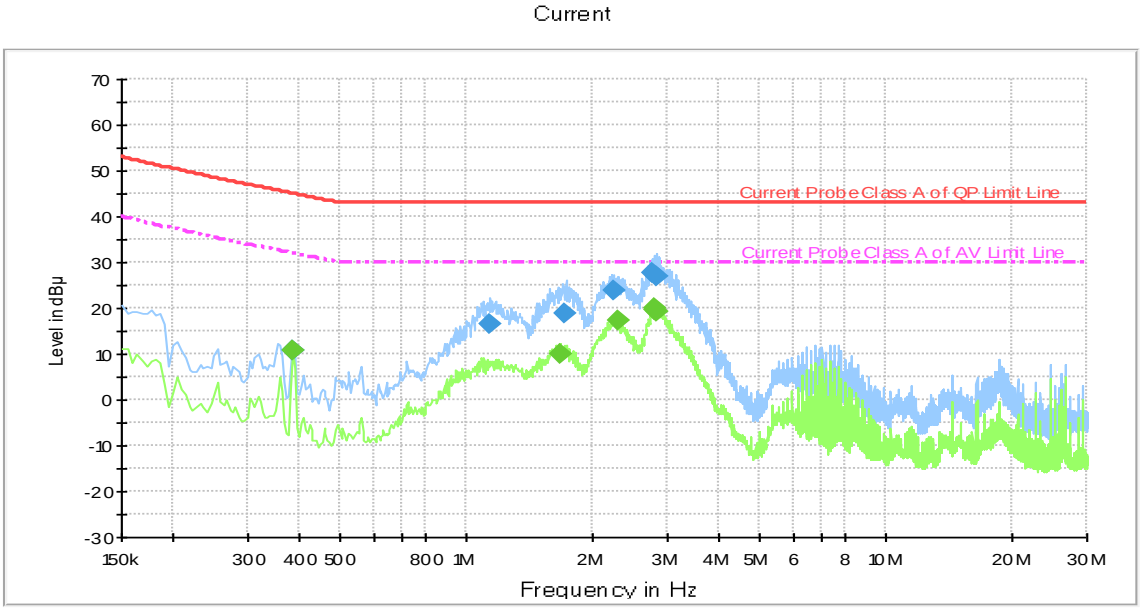
Frequency (MHz)	QuasiPeak (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.739500	23.9	43.0	19.1	1000.0	9.000	-5.2
0.968632	18.3	43.0	24.7	1000.0	9.000	-6.7
0.995498	26.1	43.0	16.9	1000.0	9.000	-6.9
0.996458	26.2	43.0	16.8	1000.0	9.000	-6.9
1.013452	25.7	43.0	17.3	1000.0	9.000	-6.9
1.022385	26.0	43.0	17.0	1000.0	9.000	-6.9

Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.717000	14.7	30.0	15.3	1000.0	9.000	-5.1
0.721499	14.9	30.0	15.1	1000.0	9.000	-5.1
1.000020	16.6	30.0	13.4	1000.0	9.000	-6.9
1.004452	16.3	30.0	13.7	1000.0	9.000	-6.9
1.022385	16.9	30.0	13.1	1000.0	9.000	-6.9
13.313438	19.2	30.0	10.8	1000.0	9.000	-9.9

Note:
Margin=Limit- Level (QuasiPeak /CAverage)
Level= Reading level+ Corr. (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

10.2.7 FXS/O Test Data



Measurement Result: QP Detector

Frequency (MHz)	QuasiPeak (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.384000	10.7	45.0	34.3	1000.0	9.000	-1.9
1.129822	16.6	43.0	26.4	1000.0	9.000	-7.2
1.716398	18.9	43.0	24.1	1000.0	9.000	-8.1
2.231378	23.8	43.0	19.2	1000.0	9.000	-8.6
2.777565	27.7	43.0	15.3	1000.0	9.000	-8.7
2.835750	26.8	43.0	16.2	1000.0	9.000	-8.7

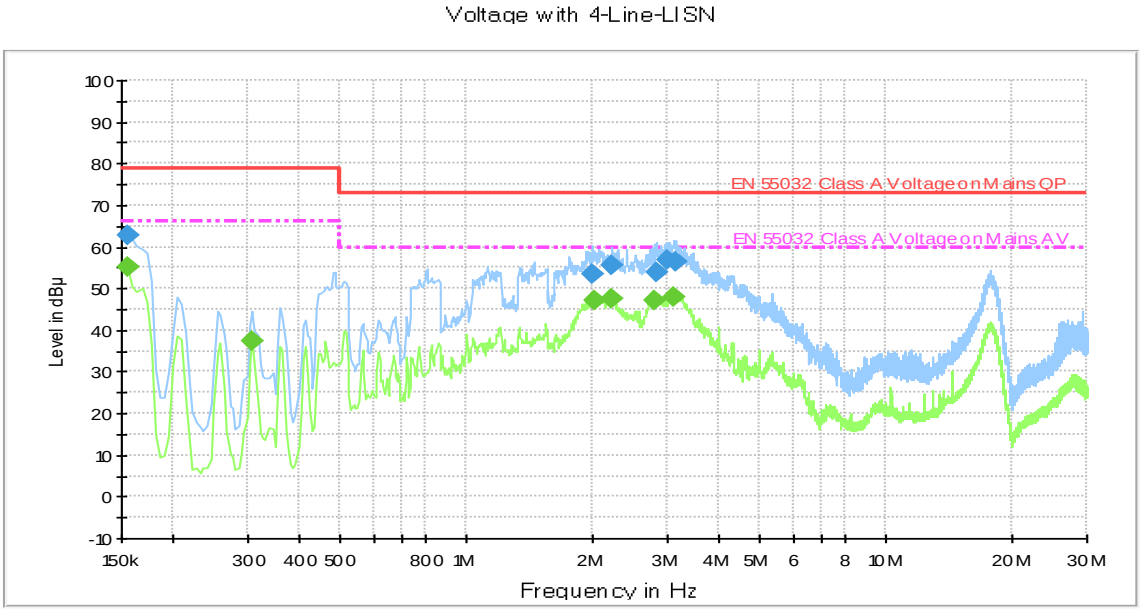
Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµA)	Limit (dBµA)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.384000	10.6	32.0	21.3	1000.0	9.000	-1.9
1.674833	10.1	30.0	19.9	1000.0	9.000	-8.1
2.294040	17.2	30.0	12.8	1000.0	9.000	-8.6
2.782132	19.8	30.0	10.2	1000.0	9.000	-8.7
2.795542	20.1	30.0	9.9	1000.0	9.000	-8.7
2.840250	19.4	30.0	10.6	1000.0	9.000	-8.7

Note:
Margin=Limit- Level (QuasiPeak /CAverage)
Level= Reading level+ Corr. (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

10.2.8 AC Power Port Test Data

For AC 230V:



Measurement Result: QP Detector

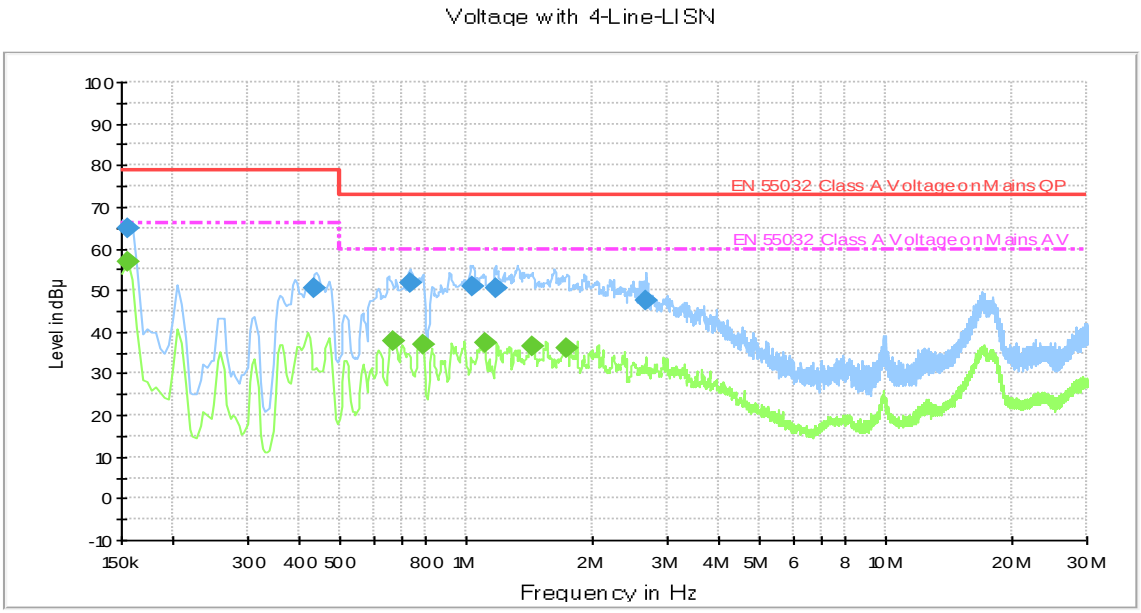
Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154500	62.7	79.0	16.3	1000.0	9.000	L2	10.4
1.995000	53.7	73.0	19.3	1000.0	9.000	L2	10.1
2.211000	55.6	73.0	17.4	1000.0	9.000	L2	10.1
2.836500	53.9	73.0	19.1	1000.0	9.000	L1	10.1
3.007500	56.7	73.0	16.3	1000.0	9.000	L2	10.1
3.142500	56.4	73.0	16.6	1000.0	9.000	L2	10.1

Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154500	55.0	66.0	11.0	1000.0	9.000	L2	10.4
0.307500	37.4	66.0	28.6	1000.0	9.000	L1	10.2
2.022000	47.0	60.0	13.0	1000.0	9.000	L2	10.1
2.220000	47.4	60.0	12.6	1000.0	9.000	L2	10.1
2.800500	47.2	60.0	12.8	1000.0	9.000	L2	10.1
3.097500	48.0	60.0	12.0	1000.0	9.000	L2	10.1

Note:
Margin=Limit- Level (QuasiPeak /CAverage)
Level= Reading level+ Corr. (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

For AC 110V:



Measurement Result: QP Detector

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154500	65.0	79.0	14.0	1000.0	9.000	L2	10.4
0.433500	50.3	79.0	28.7	1000.0	9.000	L2	10.1
0.730500	51.7	73.0	21.3	1000.0	9.000	L2	10.1
1.032000	50.8	73.0	22.2	1000.0	9.000	L2	10.1
1.167000	50.4	73.0	22.6	1000.0	9.000	L1	10.1
2.665500	47.4	73.0	25.6	1000.0	9.000	L2	10.1

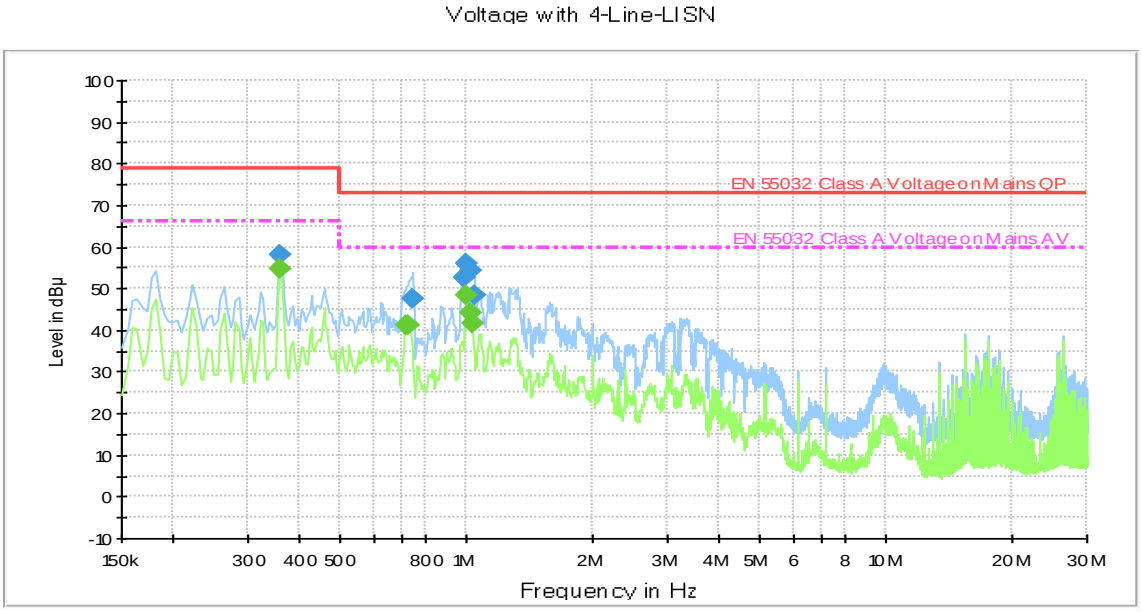
Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154500	56.8	66.0	9.2	1000.0	9.000	L2	10.4
0.663000	37.6	60.0	22.4	1000.0	9.000	L2	10.1
0.784500	37.1	60.0	22.9	1000.0	9.000	L2	10.1
1.099500	37.6	60.0	22.4	1000.0	9.000	L2	10.1
1.423500	36.5	60.0	23.5	1000.0	9.000	L2	10.1
1.725000	36.0	60.0	24.0	1000.0	9.000	L2	10.1

Note:
Margin=Limit- Level (QuasiPeak /CAverage)
Level= Reading level+ Corr. (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

10.2.9 DC Power Port Test Data

For DC -48V:



Measurement Result: QP Detector

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.357000	58.1	79.0	20.9	1000.0	9.000	L1	10.2
0.744000	47.5	73.0	25.5	1000.0	9.000	L2	10.1
0.978000	52.6	73.0	20.4	1000.0	9.000	L2	10.1
0.996000	55.8	73.0	17.2	1000.0	9.000	L2	10.1
1.014000	54.2	73.0	18.8	1000.0	9.000	L2	10.1
1.041000	48.6	73.0	24.4	1000.0	9.000	L1	10.1

Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.357000	54.6	66.0	11.4	1000.0	9.000	L1	10.2
0.717000	41.4	60.0	18.6	1000.0	9.000	L2	10.1
0.726000	41.3	60.0	18.7	1000.0	9.000	L1	10.1
0.996000	48.5	60.0	11.5	1000.0	9.000	L2	10.1
1.014000	43.9	60.0	16.1	1000.0	9.000	L2	10.1
1.027500	41.5	60.0	18.5	1000.0	9.000	L1	10.1

Note:

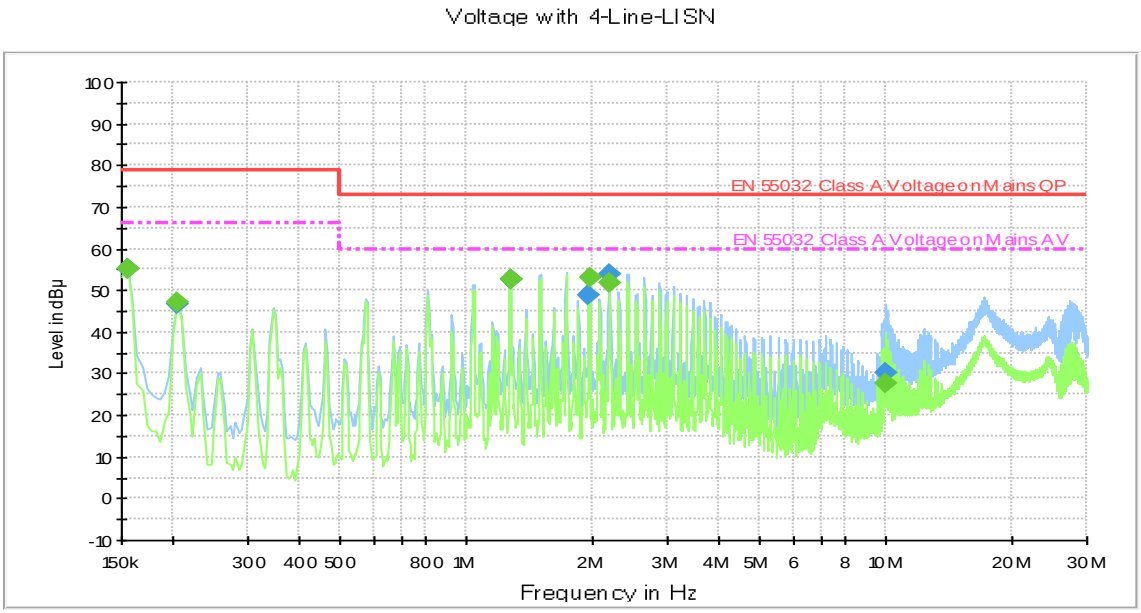
1. Margin=Limit- Level (QuasiPeak /CAverage)

Level= Reading level+ Corr. (cable loss + correction factor)

The reading level is used to calculate by software which is not shown in the sheet.

2. The test configurations of TC1-TC3 were tested, and the worst test result was supplied

For HVDC 240V:



Measurement Result: QP Detector

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154500	55.3	79.0	23.7	1000.0	9.000	L2	10.4
0.204000	46.7	79.0	32.3	1000.0	9.000	L1	10.3
1.266000	52.8	73.0	20.2	1000.0	9.000	L2	10.1
1.950000	48.7	73.0	24.3	1000.0	9.000	L1	10.1
2.188500	54.0	73.0	19.0	1000.0	9.000	L2	10.1
9.978000	30.2	73.0	42.8	1000.0	9.000	L1	10.3

Measurement Result: AV Detector

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.154500	55.3	66.0	10.7	1000.0	9.000	L2	10.4
0.204000	47.1	66.0	18.9	1000.0	9.000	L1	10.3
1.266000	52.7	60.0	7.3	1000.0	9.000	L2	10.1
1.954500	52.8	60.0	7.2	1000.0	9.000	L1	10.1
2.184000	51.9	60.0	8.1	1000.0	9.000	L1	10.1
9.991500	27.5	60.0	32.5	1000.0	9.000	L1	10.3

Note:
Margin=Limit- Level (QuasiPeak /CAverage)
Level= Reading level+ Corr. (cable loss + correction factor)
The reading level is used to calculate by software which is not shown in the sheet.

10.3 Current Harmonics

10.3.1 Test Data of Harmonic Current

Voltage/ Frequency	230 V / 50 Hz

Average harmonic current results

Hn	Ieff [A]	Ieff [%]	Limit [A]	Result
1	1.907			
2	1.132E-3	0.105	1.08	Pass
3	200.165E-3	8.703	2.30	Pass
4	1.106E-3	0.257	430.00E-3	Pass
5	88.333E-3	7.749	1.14	Pass
6	1.293E-3	0.431	300.00E-3	Pass
7	56.570E-3	7.347	770.00E-3	Pass
8	926.406E-6	0.403	230.00E-3	Pass
9	45.248E-3	11.312	400.00E-3	Pass
10	771.917E-6	0.420	184.00E-3	Pass
11	16.996E-3	5.150	330.00E-3	Pass
12	906.171E-6	0.591	153.33E-3	Pass
13	37.564E-3	17.888	210.00E-3	Pass
14	561.469E-6	0.427	131.43E-3	Pass
15	41.398E-3	27.599	150.00E-3	Pass
16	1.268E-3	1.102	115.00E-3	Pass
17	31.919E-3	24.117	132.35E-3	Pass
18	1.400E-3	1.369	102.22E-3	Pass
19	35.150E-3	29.683	118.42E-3	Pass
20	1.007E-3	1.095	92.00E-3	Pass
21	32.113E-3	19.982	160.71E-3	Pass
22	443.082E-6	0.530	83.64E-3	Pass
23	14.192E-3	9.671	146.74E-3	Pass
24	515.981E-6	0.673	76.66E-3	Pass
25	15.095E-3	11.181	135.00E-3	Pass
26	556.041E-6	0.786	70.77E-3	Pass
27	15.221E-3	12.177	124.99E-3	Pass
28	498.559E-6	0.759	65.71E-3	Pass
29	13.609E-3	11.693	116.39E-3	Pass
30	1.181E-3	1.925	61.33E-3	Pass
31	25.881E-3	23.773	108.87E-3	Pass
32	1.099E-3	1.911	57.50E-3	Pass
33	26.210E-3	25.628	102.27E-3	Pass
34	992.588E-6	1.834	54.12E-3	Pass
35	16.886E-3	17.510	96.44E-3	Pass
36	678.473E-6	1.327	51.11E-3	Pass
37	21.597E-3	23.677	91.21E-3	Pass
38	778.643E-6	1.608	48.42E-3	Pass
39	27.538E-3	31.823	86.53E-3	Pass
40	703.372E-6	1.529	46.00E-3	Pass

Maximum harmonic current results

Hn	Ieff [A]	Ieff [%]	Limit [A]	Result
1	1.910			
2	1.272E-3	0.079	1.62	Pass
3	200.413E-3	5.809	3.45	Pass
4	1.231E-3	0.191	645.00E-3	Pass
5	88.551E-3	5.178	1.71	Pass
6	1.388E-3	0.309	450.00E-3	Pass
7	56.825E-3	4.920	1.15	Pass
8	1.015E-3	0.294	345.00E-3	Pass
9	45.374E-3	7.562	600.00E-3	Pass
10	879.329E-6	0.319	276.00E-3	Pass
11	17.186E-3	3.472	495.00E-3	Pass
12	1.030E-3	0.448	229.99E-3	Pass
13	37.738E-3	11.980	315.00E-3	Pass
14	662.362E-6	0.336	197.15E-3	Pass
15	41.584E-3	18.482	225.00E-3	Pass
16	1.392E-3	0.807	172.50E-3	Pass
17	32.080E-3	16.159	198.52E-3	Pass
18	1.526E-3	0.995	153.33E-3	Pass
19	35.467E-3	19.967	177.63E-3	Pass
20	1.168E-3	0.847	138.00E-3	Pass
21	32.412E-3	20.168	160.71E-3	Pass
22	592.801E-6	0.473	125.46E-3	Pass
23	14.382E-3	9.801	146.74E-3	Pass
24	688.188E-6	0.598	114.99E-3	Pass
25	15.323E-3	11.350	135.00E-3	Pass
26	700.909E-6	0.660	106.16E-3	Pass
27	15.519E-3	12.416	124.99E-3	Pass
28	642.090E-6	0.651	98.57E-3	Pass
29	13.921E-3	11.961	116.39E-3	Pass
30	1.425E-3	1.549	92.00E-3	Pass
31	26.136E-3	24.007	108.87E-3	Pass
32	1.305E-3	1.513	86.25E-3	Pass
33	26.593E-3	26.002	102.27E-3	Pass
34	1.171E-3	1.443	81.18E-3	Pass
35	17.189E-3	17.825	96.44E-3	Pass
36	885.909E-6	1.156	76.66E-3	Pass
37	21.956E-3	24.071	91.21E-3	Pass
38	1.066E-3	1.468	72.63E-3	Pass
39	27.903E-3	32.245	86.53E-3	Pass
40	930.554E-6	1.349	69.00E-3	Pass

10.4 Voltage Fluctuation and Flicker

10.4.1 Test Data of Voltage Fluctuation and Flicker

Voltage/ Frequency	230 V / 50 Hz
Short time (Pst)	10 min
Observation time	120 min (12 Flicker measurements)

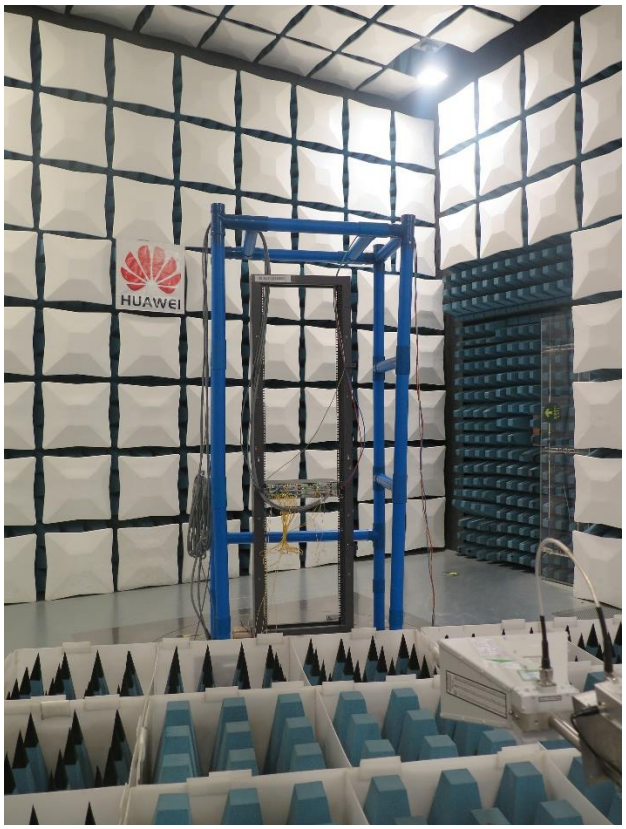
Maximum Flicker Results

	EUT values	Limit	Result
Pst	0.028	1.00	Pass
Plt	0.028	0.65	Pass
dc [%]	0.000	3.30	Pass
dmax [%]	0.036	4.00	Pass
dt [s]	0.000	0.50	Pass

11 Photographs of Test Set-up

11.1 Emission

Radiated emission for 30 MHz to 1 GHz



Radiated emission for 1 GHz to 6 GHz

Conducted emissions of AC power port

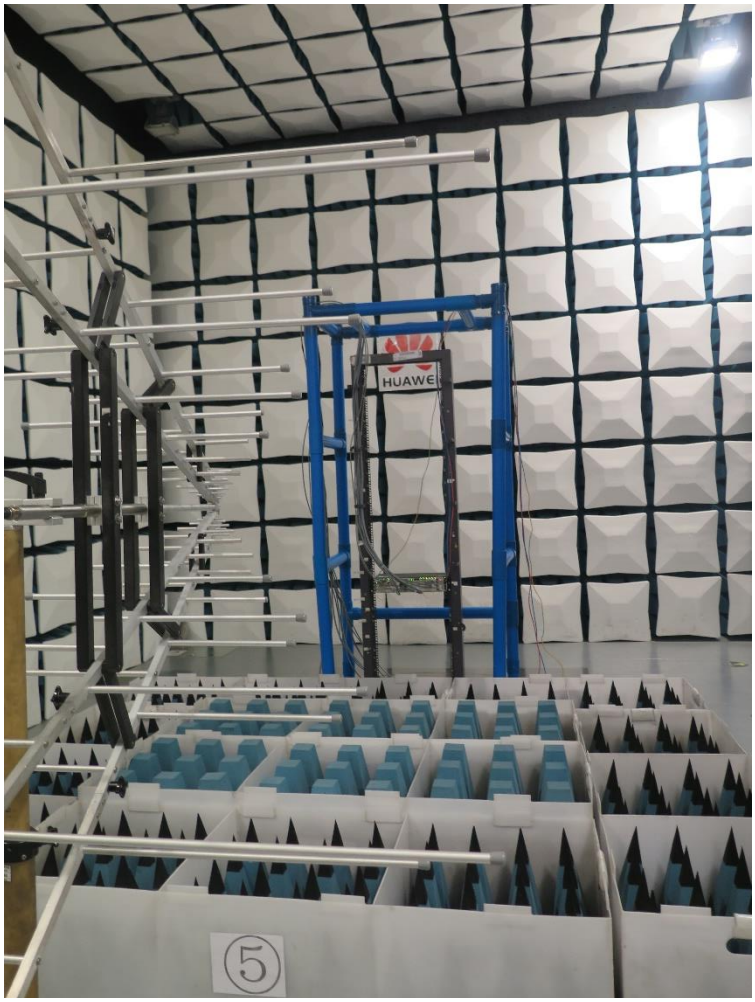
Conducted emissions of DC power port

Conducted emissions of wired network port

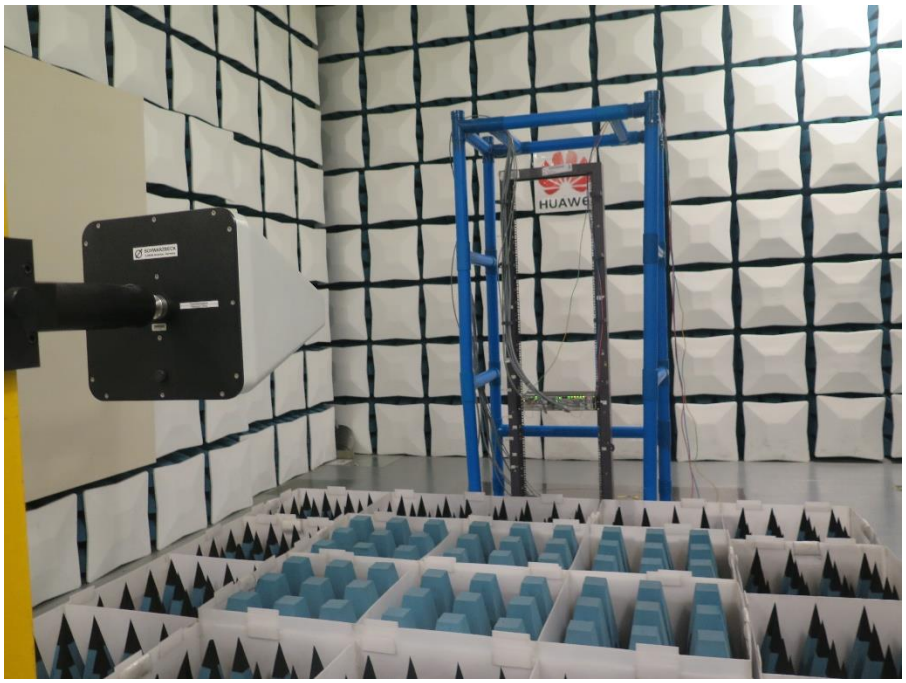
Current harmonics and voltage fluctuations (flicker)

11.2 Immunity

Electrostatic discharge



Immunity to radiated electric fields for 80 MHz to 1000 MHz



Immunity to radiated electric fields for 1000 MHz to 6000 MHz

Immunity to electrical fast transient bursts of DC power port

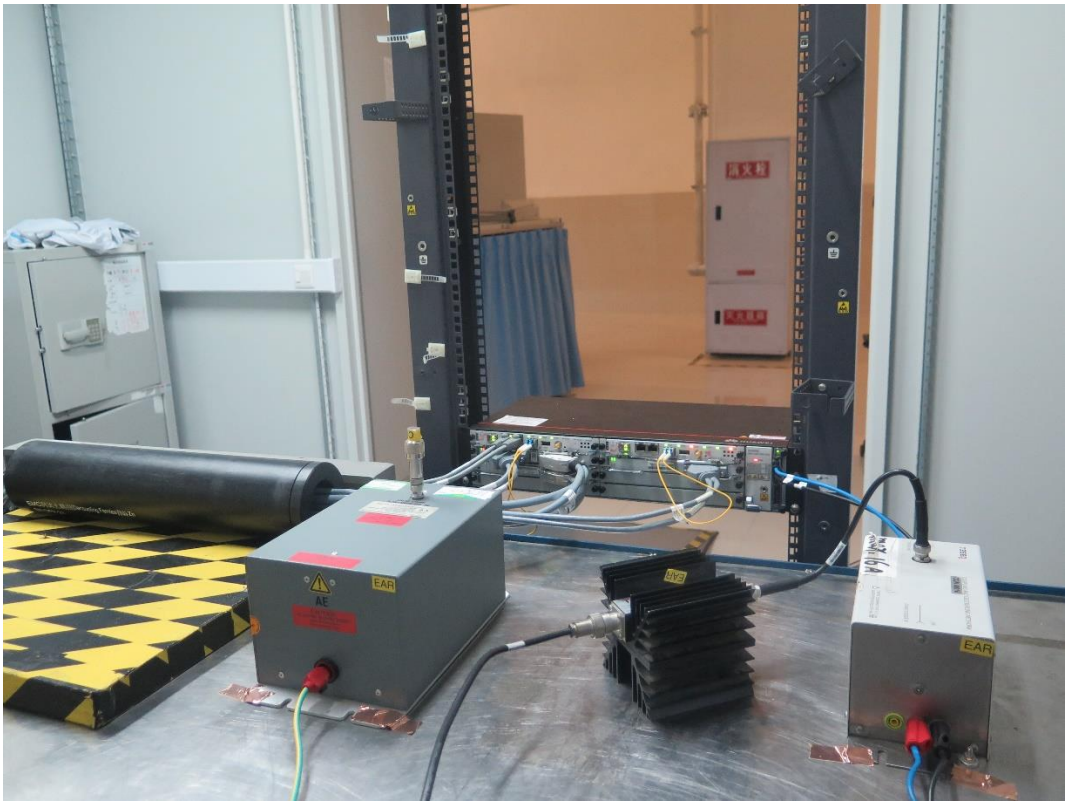
Immunity to electrical fast transient bursts of signal port

Immunity to surges of AC power port

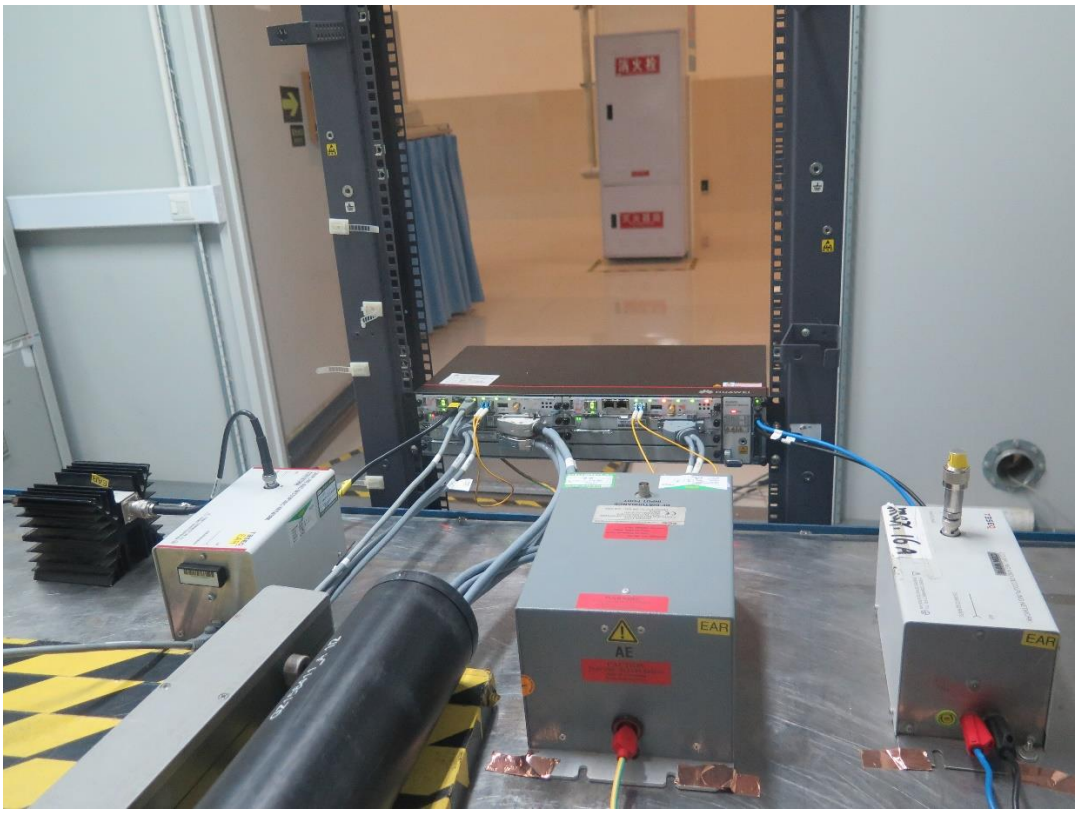
Immunity to surges of DC power port

Immunity to surges of signal port

Immunity to continuous conducted interference of AC power port



Immunity to continuous conducted interference of DC power port



Immunity to continuous conducted interference of signal port

Immunity to voltage dips, short interruption of AC power port

Immunity to voltage dips, short interruption and voltage variation of DC power port

Appendix: Abbreviation

Table 32 Abbreviation

Abbreviation	Full Name
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EMS	Electromagnetic Susceptibility
ESD	Electrostatic Discharge
EUT	Equipment Under Test
AE	Auxiliary Equipment
AC	Alternating Current
DC	Direct Current
NSA	Normalized Site Attenuation
S_{VSWR}	Site Voltage Standing Wave Ratio
LISN	Line Impedance Stabilization Network
CDN	Coupling and Decoupling Network
TC	Test Configuration
NT	Not Test
N/A	Not Applicable
RMS	Root Mean Square

END